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A TREATISE

ON

OBSTETRICS

FOR STUDENTS AND PRACTITIONERS

BY

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OBSTETRICS.

INTRODUCTORY.

OBSTETRICS is that branch of medical science which deals with mother and child, from the beginning of pregnancy until the mother has completely recovered from labor and its consequences. Several divisions of science treat of subjects which pertain to obstetrics, as anatomy, which describes the body of the mother before pregnancy occurs; physiology, which treats of ovulation, menstruation, and impregnation; and embryology, which is devoted to the growth and development of the child. The science of obstetrics embraces in part these different branches, in addition to a study of the phenomena of parturition in all its phases, and of the puerperal condition.

Obstetric art has to do with the diagnosis of the pregnant condition, its treatment, the management of labor, the detection and treatment of abnormalities in the process of parturition, and the care of the mother and her child until the former is able to take care of herself and her infant. A considerable range of medicine, surgery, and pathology is included in obstetric art, for the obstetrician who is not versed in medicine and pathology will fail to understand and properly treat the complications of pregnancy, and he who has no knowledge and skill in surgery cannot rescue mother and child from the dangers of complicated labor nor repair the injuries which may arise during parturition.

The broadening of medical education and the growth of special study have rendered the entire field of obstetrics too wide a territory to be thoroughly covered by the work and study of the general practitioner.

The complete care of the parturient woman comprises so much that is surgical that those who do not practise surgery cannot undertake obstetric work. Complicated cases of labor may require abdominal section, while many of the obstetric operations demand a technique as complete as that required for abdominal surgery. As the surgeon gives his patient the advantages of good assistants and thorough asepsis, so the obstetrician who practises his art in accordance with modern methods must do the same. The development of obstetrics has been impeded by the relative insufficiency of the compensation which obstetric work brings, but as medical science has advanced and the public has learned to distinguish between modern and efficient work and the crude and imperfect methods of preantiseptic times, good obstetric work receives proportionately a better return. The establishment of maternity hospitals gives ample accommodation for those who cannot have proper care in their homes. Only those thoroughly trained in surgery and well versed in asepsis and antisepsis can compete successfully at present in active obstetric work.

The development of medical education has given obstetrics a new place in the medical curriculum. The medical student who is properly instructed in anatomy studies the pelvis of the female with that of the male subject. His course in physiology informs him regarding the phenomena of biology, and hence ovulation, menstruation, and impregnation are studied in this department of science. Anyone who follows biology beyond its rudiments obtains a knowledge of embryology, which explains the phenomena of the growth of the human fœtus. The study of medicine, surgery, and pathology fits the medical student to appreciate the phenomena of pregnancy and labor. Obstetrics is appropriately a senior study, and should properly be undertaken during the last half of a medical course. The double responsibility which the obstetrician is called to bear in protecting the lives of mother and child, and the emergencies of obstetric practise, often serious in character, demand powers of diagnosis and decision, with skill in execution, which require the full development of the trained physician. As modern medical education is largely clinical in character, competent obstetrical teaching must include clinical instruction, with the same facilities and thoroughness which have brought medical training to its present advanced stage in other branches. The purpose of this book is to describe, within convenient limits, obstetric art, with a special regard to modern methods of diagnosis and treatment.

PART I.

PREGNANCY.

SECTION I.

DIAGNOSIS.

CHAPTER I.

OBSTETRIC DIAGNOSIS.

OBSTETRIC diagnosis, in common with diagnosis in other branches of medicine, is based upon a thorough survey of the patient, supplemented by careful consideration of the various symptoms which the patient describes. The circumstances under which the obstetrician makes a diagnosis are often different from those which surround investigation with other patients. The occurrence of pregnancy is often a matter which the patient conceals as long as possible, and regarding which her statements may be purposely or ignorantly misleading. This is especially true of illegitimate pregnancies, where the most strenuous efforts are often made to conceal the condition. In no class of cases is such care requisite to arrive at a positive conclusion, and with no patients is caution so necessary to avoid error.

Methods of Diagnosis.—Methods of making an obstetric diagnosis consist: First, in obtaining from the patient all the information available regarding her health, and especially concerning the condition which gives rise to the suspicion of pregnancy. In many cases the history, together with many of the obvious phenomena of pregnancy, easily detected, make a diagnosis a comparatively simple matter, and may even render an examination, for the time being, an unnecessary procedure. On the other hand, the most careful examination will occasionally fail to detect the positive signs of pregnancy, and the element of time must be called into play to arrive at a correct judgment.

It cannot be too strongly emphasized that thorough physical examination is absolutely essential for the positive diagnosis of pregnancy, and that no array of symptoms, however typical, should lead the practitioner to neglect the obtaining of positive knowledge.

History and Symptoms.—In obtaining a history pointing to pregnancy the first symptom which the patient will describe will be disordered menstruation, or amenorrhœa.

Disturbance of Menstruation.—If the patient wishes to conceal pregnancy, and she is asked whether menstruation continues, she may give an affirmative answer or may evade the question by asserting that this function has never been regularly performed. It is well, if possible, to bring her to describe any deviation from her accustomed health which causes her to seek the aid of a physician. As a rule, however, the patient will reply to a question regarding a change in her general health with the statement that she has not menstruated or has done so irregularly for a varying period of time.

In estimating the value of this symptom, the obstetrician has to remember the distinction between ovulation and menstruation. It has been repeatedly shown that ovulation continues in cases in which menstruation is absent. Anæmia, change of climate and occupation, or any great nervous strain, are common causes of amenorrhœa. If a patient asserts that she has not menstruated for some time, the inquiry should be made as to whether any cause, other than pregnancy, productive of the amenorrhœa, exists. Very often anæmia, tubercular infection, exhaustion, or a pathological condition of the pelvic organs may be found, accounting for the absence of menstruation. In rare cases of very young women menstruation has not occurred before impregnation, and here the symptom of amenorrhœa would be only of comparative value. The age of the patient must not mislead the obstetrician, for cases are not infrequently seen in which menstruation has persisted beyond the usual limit, and in which pregnancy has occurred after the forty-fifth year.

It is not unusual for a pregnant patient to menstruate once, or to suffer from slight oozing of blood at the menstrual periods during her pregnancy. Some of these cases are attended by slight pain occurring at the time when menstruation would have occurred if pregnancy were not present. Careful questioning, however, on the part of the obstetrician will elicit the fact that this menstruation, or this irregular discharge of blood, is not typical menstruation. So far as scientific investigation goes, it is well determined that typical menstruation does not occur during pregnancy.

In questioning the patient upon the subject of the cessation of menstruation the physician will do well to ascertain, if possible, the precise date at which the last menstrual period ended; from this date is to be reckoned the beginning of pregnancy.

Nausea and Vomiting.—In describing the symptoms which point to pregnancy the patient will next in order of frequency complain of some disorder of digestion; this is usually nausea, often accompanied by vomiting, and most frequently occurring during the early portion of the day. In some patients the sensation of nausea follows immediately the raising of the head from the pillow; in others it does not come on until the patient is up and about, and often follows the taking of fluid, or any irritation of the fauces, such as is caused in gargling the throat after brushing the teeth. Other patients are sick for a considerable portion of the day, this sickness not passing off until toward evening.

Disturbance of Digestion.—Some pregnant women complain of heartburn, with sour eructations, while others suffer from an annoying flow of saliva, which comes on soon after eating. Abnormalities in appetite are frequently observed in nervous women, for the most part simply indicating a disordered condition of the nervous system, but occasionally affording a valuable indication of the patient's needs. Rarely patients are found who are not only not sick during pregnancy, but who experience a marked increase in appetite with a great improvement in digestion. If one were to describe what might be termed the typical nausea and vomiting of pregnancy, it would be that which occurs soon after rising, which is described by the patient as simply an impulse to empty the stomach. When this is done, a mouthful or two of watery mucus is expelled, and the nausea speedily passes away.

Some patients complain of obstinate constipation, occurring from the very beginning of pregnancy. Less frequently, pregnant patients suffer from diarrhœa. Aversion to a particular article of diet is observed with some, and may even become a distinctive sign of pregnancy in multigravidous women. Cases are reported in which the first suspicion of pregnancy was caused by a sudden loathing of a familiar article of diet.

Pelvic Sensations. — Next in frequency as a subjective symptom of pregnancy patients describe abnormal sensations in the region of the pelvis. Although the size of the womb is not sufficiently great before the second month to occasion much pressure in the pelvis, in cases in which the uterus is retroverted and retroflexed pregnancy may have proceeded but a few weeks when the patient complains of weight and heaviness, backache upon exertion, and often interference with the functions of the rectum. If the uterus be anteflexed and impacted in the pelvic brim, disturbance in micturition will more frequently be complained of, and the patient more often has nausea of a severe type. In some cases of pernicious nausea of pregnancy, extreme anteflexion and impaction of the uterus are present. As the pregnancy proceeds toward the third or fourth month these symptoms will increase in either case until the uterus rises out of the pelvis.

Disorders of the General Health and the Nervous System.—Nearly all pregnant patients describe, when questioned, disorders in general health and in the functions of the nervous system. Many suffer from neuralgia, others from headache, others from perversions of sensation in the cutaneous nerves, or, less commonly, in the nerves of the special senses, while the whole nervous system becomes unduly sensitive and irritable to reflex excitants. Many pregnant patients are greatly annoyed by distressing palpitation of the heart and breathlessness upon slight exertion. In some instances syncope occurs without apparent provocation. Disturbed sleep, apprehension of injury or accident, melancholia, or perversions of the affections are not infrequently observed.

Disturbances in the skin are often reported by pregnant patients. Brownish-yellow blotches upon the face, brownish pigmentation upon the abdomen, and obstinate itching often about the region of the genital organs are not infrequently observed.

Swelling of the feet and legs, enlargement of the neck, enlargement and sensitiveness of the breasts, with tingling pains in the nipples, are often present in pregnant patients. A vaginal discharge of whitish mucus is common during pregnancy, while many patients describe the formation of hemorrhoids during this period.

In women who have borne children the mother's sensations usually render her more or less positive of the existence of pregnancy. In women pregnant for the first time all of these symptoms may be absolutely denied, or all of them may be described by the patient, either truly or erroneously.

The Examination of a Pregnant Patient.—Having noted the symptoms of pregnancy as narrated by the patient, the physician must then proceed to an examination with a view of positively determining the occurrence of pregnancy. The method of examination should vary in accordance with the objects in view: If a physician be asked to give a positive opinion regarding the existence of pregnancy in an early stage, he must, of course, shape his examination in accordance with that end. If, however, the pregnancy, if present, has advanced to the sixth month or more, his examination should then embrace not only the presence or absence of pregnancy, but, if pregnancy be found, this examination should also include the measurement of the patient's pelvis, the mapping out of the fœtus, the determination of the presentation and the attitude of the fœtus, the establishment of the period of gestation, the location of the placenta, the relative size of the fœtus and the pelvis, and the presence of any abnormality in the patient's abdomen or pelvis which might complicate her labor.

Assistants and Instruments Necessary for Obstetric Examination. — The physician is seldom called upon to make a more important examination than that in a case of early pregnancy. Where the condition is denied or the pregnancy is illegitimate, the reputation of the patient and the happiness of those connected with her are involved. If pregnancy be not discovered, a married woman may undertake exertion which may cause abortion. If the case be an obscure one and complications exist demanding operation, the question of pregnancy may determine the performance or the avoidance of the operation. If pregnancy be not present, but the patient supposes that it is, the continuance of the false pregnancy must ultimately bring mortification and ridicule alike upon the patient and physician. It is, then, of the utmost importance that a diagnosis in such a case should be made most accurately, and this is only possible by systematic methods of examination and by utilizing all helps for this purpose.

To make the ordeal as little unpleasant for the patient as possible, and in the interests of all concerned, the examination should be made with the assistance of a nurse or at least in the presence of a third reliable person. A vicious patient may take the opportunity to blackmail a physician, and a hysterical patient might readily make statements far from the truth regarding things occurring during such an examination. Hence, the physician should exercise caution in the interests of all concerned.

It is usual to place the patient in the dorsal position for such an examination. If the pelvic floor be resisting and it be difficult to palpate the pelvis, the patient may with advantage be turned upon the right or left side, when the physician will gain better access to the uterus by drawing the pelvic floor backward. In early pregnancy, where backward displacement of the womb may be present, it is often of advantage to place the patient in the knee-chest posture. Then, if the uterus be replaced by manipulation, its size and contour can be accurately determined.

If a thorough examination is demanded, the use of a speculum may be necessary in order that the physician may observe the color of the tissues about the birth-canal. Strict asepsis or antisepsis should be observed in this procedure, and the examination should be conducted as gently as possible with the least disturbance of the pelvic viscera. The examination should include the patient's entire body in all cases where the pregnant condition is not readily discovered. It is often well to place the patient upon her back and to examine the thorax and neck before proceeding to the examination of the pelvic organs. Thus the patient becomes accustomed to the examination, and is less disturbed by it.

Examination in Early Pregnancy.—Taking, however, the question of the existence of early pregnancy, the examination of the patient should be conducted as follows: The physician should first thoroughly examine the patient for evidence, outside of the pelvis and its contents, of pregnancy; he will do well to inspect the face for signs of alteration in the skin; the size of the thyroid gland should be noted; sensitiveness in any of the nerve-trunks of the face should be located, if the patient complains of pain in the face. The breasts should be inspected and their size and consistence noted, and also the presence or absence of fluid in the breasts. The nipples should be carefully inspected, and especially the areola about the nipples, in which is observed in pregnant patients a change in color from an increase of pigmentation, or alteration in pigment already deposited. The abdomen should be carefully palpated to determine the presence or absence of an abnormal condition, such as ovarian tumor, floating kidney, ascites, fibroid of the uterus, or chronic peritonitis, which might possibly give rise to a suspicion of pregnancy. It is well to have the physician's scrutiny embrace the heart and lungs, for, if pregnancy be present, the heart will be found more easily disturbed in its rhythm than normally. In some patients an examination of the lungs will detect an area of consolidation and evidence of tubercular deposit, which, taken together with the patient's anæmic condition, will explain amenorrhœa in her case. It is well, also, to examine the feet and legs to ascertain accurately the presence or absence of swelling in these parts.

The most important part of the examination to detect the presence of early pregnancy consists in the examination of the pelvic organs. For this purpose the rectum and bladder should be empty, and if the patient states that her bowels have not moved properly for several days, it is better to prescribe a purgative and to postpone the pelvic examination until the rectum is empty. It is always better to give the patient plainly to understand that if she asks a positive statement from the observer, that it is impossible to give such without an internal examination. The patient's clothing should be absolutely loose, and so arranged that the physician can readily place his hand upon the abdomen and upon the pubes. The patient may lie upon the back or upon the left side. The physician should cleanse his hands thoroughly with soap and hot water, thereby rendering them more sensitive to touch and avoiding discomfort for the patient. The physician's hands should also be rendered aseptic. It is well to anoint the examining finger with an antiseptic ointment, for which the following is a useful formula: Boric acid, ten grains; lanolin, cosmoline, each one-half ounce; carbonized vaseline or glycerin and biniodide of mercury in glycerin 1 to 500 may be used. Castile soap is often convenient.

Primigravidæ.—In primigravidæ a physician can often make a more thorough examination with the patient lying upon her side, because in this position he can draw the perineum backward, and thus gain better access to the uterus. The examination should be bimanual, the hand behind the pubes pressing downward and palpating the uterus through the abdominal wall. If a positive opinion be desired, and the patient be nervous and difficult to examine, it is often well to anæsthetize her before the examination.

Cervix.—In making this examination the physician will note by the sensation conveyed to the finger whether the arteries in the vagina pulsate markedly or whether there is no evidence of increased vascularity in this region. He will also observe by touch any marked increase in the temperature of the part and the presence or absence of secretion. The physician will remember that the cervix in the non-pregnant patient is firm, small, and conveying no sensation of softness upon touch. In pregnancy, however, the cervix has a soft, velvety feel, and it is manifestly enlarged; for the first few weeks of pregnancy there is often a plug of mucus in the cervical canal, the whole constituting a marked difference between the cervix of pregnancy and that in the non-pregnant.

Corpus Uteri.—The point of greatest importance to determine, and upon which the diagnosis of early pregnancy may be established or rejected, is the comparative size of the body of the uterus and the

Lower Uterine Segment.—Having noted that the body of the womb is enlarged, the examiner should next endeavor to detect the presence of the lower uterine segment; this consists of fibrous and elastic tissue which connects the upper, thick, contractile segment of the uterus with the cervix. While investigators differ as to the condition of the cervix during pregnancy, the weight of evidence is in favor of the belief that the cervix does not increase in length during pregnancy, but that the greater length of the uterus as pregnancy advances is owing to the development of the lower uterine segment and the growth of the upper contractile segment. This elastic portion may be recognized so early as five or six weeks of gestation, if the observer can get the finger just above the cervix, strongly indenting the uterus at that level.

In cases where the uterus can be pressed down in the pelvis the finger in the vagina will be able to indent the tissues just above the cervix. In other cases where the uterus is inaccessible it is sometimes possible, by inserting the longest finger of the hand in the rectum, to appreciate the existence of the lower, elastic uterine segment. When the examiner can clearly outline the upper, contractile uterine segment bulging smoothly above the surface of the lower segment, strong, positive evidence exists that pregnancy is present. Diseased conditions of the uterus never cause development of its lower segment. The presence of the lower uterine segment and the contrast which it affords between the neck and the body of the womb is known as Hegar's sign of pregnancy.

Tubes and Ovaries: Rectum.—Although the ovaries and tubes share in the hypertrophy which the uterus undergoes during pregnancy, still it is not often possible to outline them by vaginal examination. If the patient has complained of slight, irregular discharge of blood, her pregnancy being several months advanced, it is well to examine the rectum for the existence of hemorrhoids. The rupture of hemorrhoids in some cases of pregnancy gives rise to a discharge of blood which is erroneously believed by the patient to be menstruation.

Uterine Contractions.—During the examination of the patient to determine the size and shape of the uterus, the physician will frequently apprehend one of the principal signs of pregnancy, namely, rhythmical contractions of the uterus. From the study of embryology, as well as observation upon the human subject, it is evident that such contractions proceed from the very beginning of pregnancy until the occurrence of labor. Their purpose seems to be to bring the long axis of the fœtus to coincide with that of the mother's uterus, and also, during the latter part of pregnancy, to bring the child to the brim of the pelvis and cause it partially to engage. They are exaggerated by any manipulation, and in sensitive patients may give rise to considerable suffering. When pregnancy is sufficiently advanced to appreciate fœtal movements, it is often difficult to distinguish between uterine contractions and fœtal motion. Examination is apt to cause the womb to contract, when the fœtus, stimulated by its contractions, moves more actively than usual. The recognition of uterine contractions assists in diagnosticating between intra and extrauterine pregnancy. In the latter, while the tumor may resemble the uterus in early pregnancy, it does not contract as distinctly as does the womb.

Ballottement.—When pregnancy has advanced to four or five months, if the lower uterine segment be distended, or if, as in multigravidæ, it be possible to insert the finger into the cervix, the physician may elicit the sign called "ballottement." This is effected by pushing away from the finger the head of the child, floating in the amniotic liquid. If the finger be allowed to remain, the head will gradually descend in the amniotic fluid and fall gently against the finger-tip; this has long been considered a positive sign of pregnancy, although it sometimes gives rise to error. In hysterical and nervous patients, contraction of the recti and abdominal muscles may simulate rhythmical contractions of the uterus and occasion error in diagnosis.

Abnormalities of the Uterus.—Malformations of the uterus naturally confuse the physician and cause him to make erroneous diagnoses; the most frequent of these is bicornate uterus, in which one-half of the womb may contain the child, the other half remaining empty and undeveloped. Examination in such cases fails to reveal the usual symptoms of pregnancy, but discloses what is apparently a small and empty uterus and immediately beside it a tumor, which, as pregnancy advances, may be recognized as a sac containing a living fœtus. It is evident that a fibroid tumor of the womb may so completely alter the usual conditions present as to make a positive diagnosis during early gestation impossible.

The Period of Gestation.—The period of gestation can be best computed by physical examination, which furnishes a far more reliable basis of judgment than do the statements of the patient. While the uterus has been accurately measured at various stages of gestation, the physician must carry in mind certain landmarks in the abdomen and remember the relation which the fundus of the uterus bears to these landmarks at various periods of pregnancy.

For estimating the period of gestation, the symphysis pubis, the umbilicus, and the tip of the sternum may be taken. The practitioner will do well to remember that the uterus cannot be felt rising distinctly behind the symphysis pubis until the third or fourth month of gestation. At the sixth month it is at the umbilicus; at the ninth month it causes the tissues beneath the tip of the sternum to be considerably distended; and at the termination of normal pregnancy it is to be found two or three fingers' breadth below the tip of the sternum and a little more than a hand's breadth above the umbilicus.

If it is desired to estimate the period of gestation more minutely by reference to the size of the uterus, it may be remembered that at the end of the first four weeks of pregnancy the uterus is slightly enlarged; at the termination of the second month of pregnancy the uterus is as large as a man's fist; at the end of the third month of gestation it is as large as a man's fist upon which is placed the expanded hand; at the termination of the fourth month it is as large as a fœtal head at term, and can be distinctly felt just above the brim of the pelvis; at the end of the fifth month it is two or three fingers' breadth above the brim of the pelvis, half-way between the symphysis pubis and the umbilicus; at the sixth month it is at the umbilicus; at the seventh two fingers' breadth above it; at the eighth a hand's breadth; at the ninth putting the tissues at the tip of the sternum on the stretch, and then gradually descending until, before labor, it is again a little more than a hand's breadth above the umbilicus. Experience in abdominal palpation will enable the obstetrician to form a very accurate judgment as to the period of gestation, and he may be able to correct an error in a patient's calculations of several weeks. On the other hand, it must be remembered that the exact period of gestation cannot in most cases be determined, and that errors of one or two weeks are by no means uncommon with good observers.

The Bladder and Urethra During Pregnancy.—If the womb be anteflexed before pregnancy occurs, during the development of the ovum considerable pressure on the bladder will be made as the uterus rises from the pelvis. This will occasion frequent micturition and sometimes considerable distress on the part of the patient, and upon examination the bladder will be found unusually irritable and with its mucous membrane reddened and congested. In extreme anteflexion with anterior impaction of the uterus, the urethra may be so compressed as to make emptying of the bladder difficult and cause retention of urine. Schaeffer[5] calls attention to the reddish color of the tissues about the urethra, extending transversely and obliquely in stripes. He regards this as strongly indicating the pregnant condition.

The Examination of the Blood.—In a case difficult of diagnosis, where every means must be exhausted to arrive at the facts, the examination of the blood may assist in forming an opinion. Schaeffer[6] found the relation between the dark and highly-colored blood cells to the lighter colored and paler erythrocytes to be in the non-pregnant from 2.5 and 5 to 1. In pregnancy it may vary greatly, becoming in the seventh month as high as 21 to 1. Uterine contractions, when labor begins, greatly alter this proportion also. Henderson[7] found from the study of a large number of cases that at the termination of pregnancy the red cells presented no abnormal feature, but deficiency in rouleaux formation. Leucocytosis was always present in varying degree during pregnancy. In a few cases fibrin was far in excess. The average red cells at the end of pregnancy were 3,906,666, the average hæmoglobin 68 per cent., the color index, .78. At the termination of pregnancy the white corpuscles average 21,365. Digestion leucocytosis was not observed during pregnancy. The following cells were recognized among the leucocytes: polymorphonuclear neutrophile, 78.7; large lymphocyte, 8.8; small lymphocyte, 10.8; eosinophile, 1.7 per cent. Maternal blood at the termination of pregnancy showed a mild secondary anæmia, with decided leucocytosis. In multiple pregnancy, leucocytosis was diminished.

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[5] **Schaeffer**: Centralblatt für Gynäkologie, No. 50, 1901.

[6] Ibid.

[7] **Henderson**: Journal of Obstetrics of the British Empire. February, 1902.

The Examination of the Urine.—In primiparæ, serum albumen is found so frequently in the urine in small percentage that its presence may be estimated one of the signs of gestation. Care must be taken to distinguish serum albumen from mucin, and delicate tests for albumen may be necessary to recognize the small quantity present. This albuminuria may be differentiated from a transient albuminuria by repeated examinations of the urine.

CHAPTER II.

THE DIFFERENTIAL DIAGNOSIS OF PREGNANCY.

We have already alluded to the importance of an accurate diagnosis in a case in which pregnancy may possibly exist. The recognition of pregnancy in contrast with pathological conditions of the pelvic organs, and especially the detection of pregnancy in cases where disease in the pelvic viscera is present, occasion great difficulty at times and tax the greatest powers of diagnosis.

In the foregoing chapter early pregnancy has been considered from the standpoint of diagnosis before the development of the fœtus is sufficiently advanced to permit a positive conclusion by hearing the heart-sounds or feeling or seeing the movements of the child. It can readily be understood that many other growths in the abdomen and pathological conditions of the abdominal viscera may occasion confusion and be mistaken for pregnancy. In attempting to differentiate between pregnancy and pathological conditions the practitioner should remember to conduct his examination in a methodical manner; he can hope to arrive at a correct conclusion by the exclusive use of no one method of investigation. Inspection of a patient, percussion, and auscultation, with careful mapping out of areas of dulness or tympany, must be resorted to if a correct diagnosis is to be made.

Abdominal Fat.—Among the most common abnormalities which occasion a suspicion of pregnancy is the deposit of fat in the abdominal wall; this condition often occurs in women past the most fruitful period of sexual life and who may earnestly desire offspring. They may experience many of the sensations which they have formerly felt or which have been described to them as peculiar to pregnancy. Their gradual increase in size in the abdominal region often persuades them that pregnancy really exists. As this condition is especially likely to occur just prior to the menopause, abnormalities in menstruation happening at this time strengthen the patient's belief in the existence of pregnancy.

In examining such patients it is well to remember that all nervous women are liable to a considerable accumulation of gas in the intestinal tract; this gas sometimes forms during an examination, and by distending the abdomen may considerably obscure a diagnosis. To appreciate the thickness of the abdominal wall it is necessary for the examiner to grasp the tissues between the thumb and fingers; in that way he can recognize the fact that the wall itself of the abdomen is enlarged, and not necessarily any of the viscera. When the fat is not firmly bound down by interlacing connective tissue, it is often possible to obtain the sensation known as the "percussion wave of fat;" this is often met with in women who have a deposit of fat not only in the abdominal wall, but also in the mesentery. It is to be obtained by placing one hand broadly upon the side of the abdomen and tapping quickly with the fingers the opposite side of the abdomen. This slight percussion wave does not alter upon changing the position of the patient, as does the wave caused by fluid, and the wave impulse is much less marked than is the case where fluid is present. It has been observed that just above the symphysis pubis the deposit of fat in such subjects is reduced to a minimum, and here it is frequently possible to sink the fingers deeply into the abdominal wall and appreciate the deposit of fat in the surrounding parts.

Hernia.—In women who have borne a child repeatedly the abdominal walls may be very much relaxed, and a separation of the recti muscles may permit the protrusion of the peritoneum and mesentery between the separated tendons; this mass, however, is easily distinguished from the pregnant uterus.

Rare Abdominal Tumors.—Tumors of the abdominal wall are of rare occurrence, and very seldom complicate the diagnosis of pregnancy. Abscess in the abdominal wall will be detected by the usual signs of a collection of pus, and the attention of the physician will have been drawn to its existence by the previous history of the case. Tumors from the periosteum of the pelvis, hydatids of the abdominal cavity, actynomix of the abdominal cavity, and malignant growth of the intestine and surrounding tissues may all complicate a diagnosis of pregnancy. In each of these conditions, however, the contour of the uterus is not that of pregnancy, and positive signs that gestation exists are found to be wanting.

Ascites.—One of the most common pathological conditions of the abdomen which might complicate a diagnosis of pregnancy is ascites. Here, again, the observer may obtain a percussion impulse caused by the ascitic fluid. On percussing the abdomen a somewhat clear or tympanitic note is usually found along the centre of the abdomen, while, as the patient lies upon her back, at the sides of the abdomen and in the flanks there is the marked dulness which tells of encysted fluid; the explanation of this phenomenon is found in the fact that while the patient lies upon her back the fluid gravitates to the sides of the abdomen, while the intestine, containing more or less gas, is displaced by the fluid and floats up into the centre of the abdomen. If, now, the patient be placed upon her side, it will be observed that the area of dulness upon the side on which she is lying will be largely increased, while over the remaining portions of the abdomen a clear or partially tympanitic note will be found.

Tubercular Peritonitis.—Encysted dropsy, often tubercular in character, may occasion considerable confusion in diagnosis, as it may simulate very closely the pregnant uterus and its contents. Tubercular peritonitis, where adhesions form, shutting off a portion of the peritoneal cavity from the remainder, very closely resembles pregnancy in many respects.

Ovarian Tumors.—Ovarian tumors are to be distinguished from pregnancy from the fact that in these cases, if the contents of the tumor are fluid, the examiner detects a distinct fluid-wave transmitted from one side of the abdomen to the other. He fails by palpation to outline the body of the fœtus, and by auscultation he is not enabled to hear the fœtal heart-sounds. Vaginal examination would show in such a case that the uterus had not increased in size. Where the tumor is both solid and cystic, careful palpation may sometimes be required to recognize the fact that the contour of the solid portion of the tumor is not that of the body of the fœtus. Failure to appreciate fœtal heart-sounds and fœtal movements after careful search for them will show that pregnancy is absent.

OVARIAN TUMOR.	PREGNANCY.
Usually begins from one side of the pelvis.	Abdominal tumor is central.
Growth usually more rapid than that of pregnancy.	Growth proceeds steadily. Can be recognized without difficulty.
By vaginal examination, uterus displaced but unaltered.	By vaginal examination, characteristic changes in the uterus.
Palpation and percussion detect elastic contents and percussion wave. Auscultation fails to detect fœtal heart-sounds or placental bruit.	Palpation and percussion find much less percussion wave and outline fœtus. Auscultation detects fœtal heart-sounds and placental bruit.
Patient's general health becomes markedly impaired.	As pregnant womb grows, patient's general health improves.

Diagnosis of Pregnancy Complicated by Ovarian Tumor.—Great difficulty is sometimes experienced in cases in which ovarian tumor complicates pregnancy. In early pregnancy, a small ovarian tumor may readily exist undetected. Such a tumor displaces the womb, usually pushing it backward in the pelvis, and frequently becomes impacted in the pelvic cavity. As pregnancy advances, one of the pelvic tumors must rise out of the pelvic cavity. Usually the uterus does so, and it is not infrequent for the pedicle of the ovarian tumor to become twisted during this stage of pregnancy. A large ovarian tumor and the uterus near term can scarcely exist in the same abdominal cavity. Either abortion occurs or the ovarian tumor makes itself known by twisting of the pedicle, with the symptoms resulting therefrom, or by the excessive size of the abdomen. To make a complete diagnosis of pregnancy complicated by ovarian tumor, anæsthesia must frequently be employed. While both tumors are small, one can be pushed out of the pelvic cavity and the character of the other accurately ascertained. Diagnosis of ovarian tumor complicating pregnancy is usually made in the early stages of pregnancy, as experience shows that it is far safer to perform abdominal section and remove the tumor than to risk twisting of its pedicle and the complications which this accident produces.

Floating Kidney and Spleen.—Floating kidney and spleen may occasion confusion in diagnosis by presenting a large, solid tumor in the abdomen. The fact that these tumors are entirely solid, the absence of fœtal heart-sounds, failure to find these tumors proceeding from and connected with the uterus, and the fact that they can often be replaced to their proper position in the abdomen, make a differential diagnosis not a matter of great difficulty.

Uterine Tumors.—Tumors of the uterus itself may occasion a suspicion of pregnancy, and may sometimes, by their presence, complicate an existing pregnancy. The growth and development of a uterus the seat of fibroid changes are, however, not usually symmetrical and smooth, like that of the pregnant womb. In interstitial fibroids, while the surface of the uterus may be smooth, still the lower uterine segment remains undeveloped, and the contour of the fœtus cannot be outlined. Cancer of the endometrium may cause a symmetrical development of the uterus; but here, again, the lower uterine segment is absent, while upon palpation and auscultation it will be seen that the uterus is not in the pregnant condition. Cancer of the cervix produces such characteristic changes that the cervix could not be mistaken for that of the pregnant womb. Pregnancy may occur in a fibroid uterus, and in such a case a most careful examination is required to detect the fact. It will usually be necessary to examine the patient under an anæsthetic, and to map out very carefully, if possible, the condition complicating the pregnancy. The presence of cancer of the womb does not prevent conception, and pregnancy may advance to the period of viability although cancer be present.

MYOMA OR FIBROID OF THE UTERUS.	PREGNANCY.
The growth of the tumor is irregular in duration.	The uterus enlarges steadily as pregnancy advances.
If the myomatous tumors be subperitoneal they can usually be felt upon examination. If the tumor is	The uterus may not be symmetrical in shape and its contractions may cause it to simulate a fibroid uterus very

submucous it will be detected by passing the finger through the cervix. If the tumors are interstitial, they cannot be recognized in their early development.	closely. These contractions, however, are not permanent, and by repeated examination the observer can detect the smooth and largely symmetrical development of the pregnant womb.
The lower uterine segment is not developed in the fibroid uterus.	The lower uterine segment develops during pregnancy.
The cervix does not undergo the changes characteristic of pregnancy.	The characteristic changes of pregnancy are present.
Irregular discharges of blood from the uterus occur.	In normal pregnancy, uterine hemorrhage is absent. In placenta prævia and accidental separation of the placenta, hemorrhage is present, but very different from the bleeding from the fibroid womb.
The patient does not improve in health. As the tumor grows, her pain increases. Blood loss produces anæmia.	The patient's condition becomes more comfortable as pregnancy advances. When nausea ceases, anæmia disappears.

The Diagnosis of Pregnancy Complicated by the Presence of Fibroid Tumor of the Uterus.—During early pregnancy, a positive diagnosis of fibroid tumor and pregnancy is often impossible. Examination at this time may detect the characteristic changes in the cervix while the contour of the body of the womb is abnormal. It must be remembered, however, that until the entire cavity of the uterus is occupied by the fœtus and its appendages, the uterus may be so asymmetrical in development as to simulate a tumor. As pregnancy advances a fibroid uterus often becomes impacted in the pelvis. Upon careful examination with the patient anæsthetized, fibroid nodules will usually be found or the wall of the womb will be observed to be firm, nodular and hard, and not to have the consistence characteristic of pregnancy. As pregnancy advances, the diagnosis will be made differently, in accordance with the variety of the tumor present. If the myoma be subperitoneal, the development of the uterus will not be impeded, and the tumor will usually be felt through the abdominal wall if the patient be anæsthetized. If the tumors be interstitial, they may give no positive sign of their presence. The uterus will be firmer than normal, but symmetrical in development. If the tumor be submucous and small, the fœtus may develop to or beyond viability and premature labor come on. Upon examination, when the cervix dilates, the physician can find the tumor or the head of the child presenting. If the tumor presents, its pedicle can usually be recognized. If the child presents, the tumor will usually be detected after the expulsion of the fœtus. Fœtal limbs often simulate the nodules of fibroid tumors. Thus twin pregnancy has been mistaken for fibroids, and the abdomen has been opened to remove the tumor. Careful attention to the cardinal points of difference, as given in the table above, will usually enable the physician to escape a serious error.

Phantom Pregnancy.—Distension of the abdomen with gas has already been mentioned; this is often termed "false pregnancy" or "pseudocyesis." In these cases the solid fœtal body is absent on palpation, while the administration of an anæsthetic will cause the tumor to disappear. The physician must not be misled by the history given by the patient. These cases go into spurious labor, and often counterfeit exactly the symptoms of parturition.

Ectopic Pregnancy (Extra-Uterine Gestation).—In connection with this it seems best to draw the attention of the reader to the fact that the impregnated ovum may lodge and develop outside the cavity of the uterus; this may occur in cases of twin pregnancy, in which one twin is developed within the uterus of the mother, while the other may lodge and grow in the Fallopian tube or in the abdominal cavity itself. While the subject of ectopic gestation will be considered in another portion of the book, still it is well to review the differential diagnosis of this condition at this point.

When a patient suffers from disordered menstruation or from irregular uterine hemorrhage, complaining of sharp, intermittent pain at one side of the uterus, while many of the subjective symptoms of pregnancy are present, a suspicion of ectopic gestation is justifiable. On examination the uterus will be found but slightly enlarged. In the early weeks of ectopic gestation the ovum will be found usually at one side of the uterus and in the pelvis, forming a tumor, elastic and ill-defined and sometimes boggy to the touch. The uterus can be demonstrated to be empty by the cautious use of a uterine probe or sound. In cases where rupture of the Fallopian tube has occurred, the tumor may be found deeply situated at the sides of the pelvis or behind the uterus in Douglas's cul-de-sac. The impression given to the examining finger is that of a baggy mass, indistinctly outlined. The uterus, again, is found in an abnormal position, being crowded out of its usual location by the tumor. The womb is empty, and the hemorrhage which often comes from it contains portions of decidua. In cases seen in advanced ectopic gestation, if the child be living, it may be outlined by palpation in the abdominal cavity, and its heart-sounds can be heard. Here, again, the uterus will be found developed but partially and containing the decidua characteristic of ectopic pregnancy.

Interstitial Pregnancy (Pregnancy in Uterine Cornu).—The impregnated ovum may lodge in the Fallopian tube as it passes through the wall of the uterus to empty into its cavity. This tissue is capable of considerable distention, and an ovum may develop for some time in this situation. This pregnancy is ectopic in the strict sense of the term, but is not extrauterine. It can rarely be differentiated from tubal gestation unless the case comes to operation. In some of these cases the ovum is undoubtedly extruded into the uterine cavity, while in others the tissue, becoming friable, ruptures, hemorrhage occurs into the pelvis, and the case resembles closely a ruptured tubal gestation. If such a case were examined before rupture, an enlargement could be detected at the uterine cornu, but its precise nature could not be ascertained without section.

Displacement of the Pregnant Uterus Simulating Ectopic Gestation.—Retroversion of the normal pregnant uterus may exactly simulate ectopic gestation. In cases of threatened abortion, where prolonged bleeding occurs, a retroverted pregnant womb may become so softened and distended with blood as to exactly simulate the pelvic hæmatoma produced by ruptured ectopic gestation. To make a positive diagnosis, the physician has his choice of two procedures: First, to anæsthetize the patient and attempt the replacement of the tumor which occupies the posterior cul-de-sac. If the tumor be the retroverted pregnant womb, it can usually be replaced under anæsthesia or with the patient in the knee-chest posture, with some risk of abortion following. Abortion, however, will occur in such a case unless the uterus rises out of the pelvis, so that this risk need not be seriously considered.

If the physician strongly suspects ectopic gestation, positive diagnosis and efficient treatment may be impossible without abdominal section. If the case be one of ruptured ectopic gestation, it is readily dealt with by section. If the pregnant womb be retroverted, it can be raised to its normal position when the abdomen is opened. Pregnancy need not be interrupted by this manipulation.

Abnormal Location of the Placenta Simulating Ectopic Gestation.—The attachment of the placenta to the lower uterine segment, or to the junction of the upper and lower segment of the uterus, may produce a condition closely resembling ectopic gestation. The tissues on one side of the uterus will be softened and thickened; there will be slight discharge of blood from the womb, and increased sensation of pain and weight in the pelvis. Close observation of the case, with careful vaginal examination, will usually clear up the doubt. If the finger can be carried through the cervix, the presence of the placenta can often be ascertained.

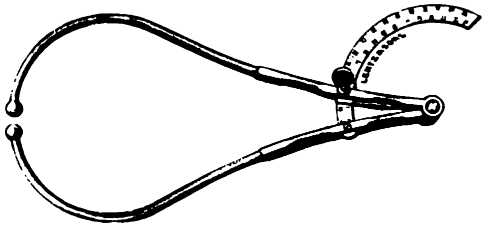
CHAPTER III.

THE DIAGNOSIS OF ADVANCED PREGNANCY.

A POSITIVE diagnosis of pregnancy with living child can be made so soon as the existence of the fœtus is appreciable by sight, hearing, or touch on the part of the examiner. This becomes possible soon after the fifth month. It is not possible, however, to outline the position of the fœtus definitely before the period of viability is reached, which is from the twenty-sixth to the twenty-eighth week of gestation. In cases of pregnancy where no manifest deformity of the pelvis exists, the physician may defer his complete examination of the patient until the period of viability. He cannot, however, fulfil his duty if he omits such an examination at this period; the importance of the knowledge which may be gained by a thorough examination cannot be appreciated except by experience. To a physician who is accustomed to study his patient carefully, it is of the greatest assistance to know, when summoned to a case, with what sort of pelvis he is dealing; what is the position of the fœtus; what the comparative strength of the mother, and other details which are afforded by such examination. This information is obtainable without exposing the patient and without subjecting her to pain or to more than trifling inconvenience. We have yet, in our experience, to meet with objection from any intelligent woman to a reasonably conducted examination. In view of this experience, we cannot consider that the physician performs his duty to his patient if knowledge so obtainable is disregarded.

Instruments and Methods.—The instruments convenient for making a thorough obstetric examination are a pelvimeter, a stethoscope, and a tape-line. None of these is absolutely essential to a very useful examination, but a complete survey of the patient cannot be made without them.

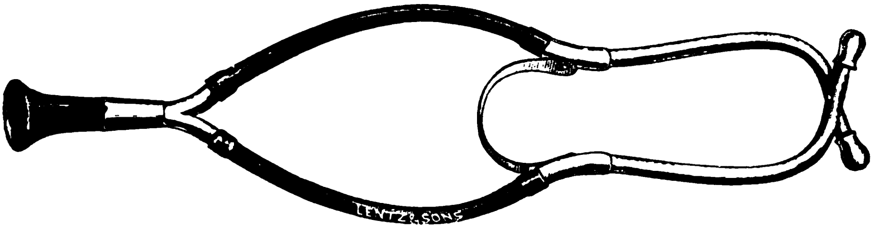
FIG. 1.



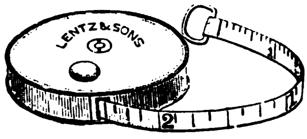
Pelvimeter. Scale in centimeters and inches. Can be taken apart.

An appointment may be made either to have the patient visit the physician's office, accompanied by a friend, or assisted by an office nurse, or the physician may call upon the patient at some convenient time. In either event the patient should lie comfortably upon a bed or table, the surface of the body from the umbilicus to beneath the trochanters of the femora covered by one thickness of linen only. A sheet which has been repeatedly washed and perfectly pliable is best for this purpose. The physician will do well to wash his hands thoroughly in hot water, a procedure which will increase the sensibility of the hands and enable him the better to palpate the abdomen. It is proper and useful to explain to the patient the method of examination, the reasons for it, and the fact that it is of comparatively modern origin, and that she is thus enjoying the benefits of recent advances in medical practice. In very nervous women or ignorant patients it is well to show them the pelvimeter, and let them feel with the hands that it is not a painful instrument. There is nothing in the appearance of the pregnant abdomen which is not seen in the abdomen distended by other tumors. It is unnecessary to expose the abdomen in pregnancy to make a complete and thorough examination. The abdominal surface gives testimony of distention by a tumor, but nothing else. Patients are relieved when informed that this procedure does not include a vaginal examination unless some unusual condition be present. Where external examination gives no evidence of abnormality, a vaginal examination is unnecessary, and may expose the patient to danger of infection or miscarriage.

FIG. 2.



Light binaural stethoscope.

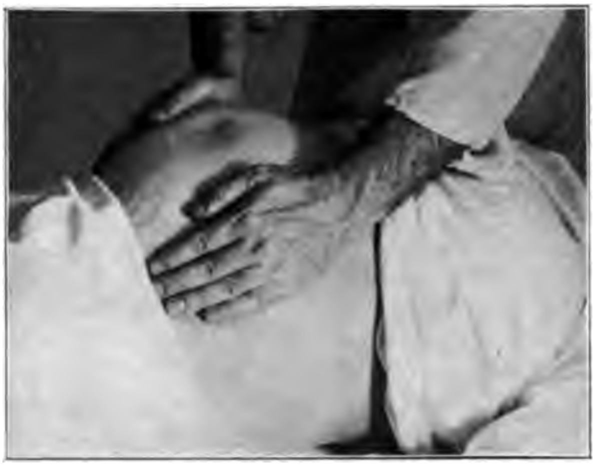


Steel tape-line, in inches and centimeters.

Points to be Ascertained by Examination.—The objects of such an examination are, first, to determine positively the presence of pregnancy and the fact that the fœtus is living. The period of gestation is next estimated, and the attitude and location of the fœtus ascertained. Very often the position of the placenta upon the uterine wall can be recognized. The presence of multiple pregnancy can usually be diagnosticated during this examination. The size of the mother's pelvis is also to be obtained, and the condition of the uterine muscle, the round ligaments, and the abdominal muscles is also observed. The examiner will be able to say whether the patient is a primigravida or if she has borne many children by his examination. The relative size of the fœtus and the mother is also to be determined, and from the factors thus placed in the possession of the physician he may give an intelligent prognosis as to the patient's labor. The presence of large quantities of gas or hardened feces in the intestine should be noted. The entire examination, in the hands of one accustomed to make it, need not consume more than a half hour's time, and the patient need not be put to serious discomfort nor made to suffer pain.

Palpation. — The presence of a living fœtus within the abdomen of the mother is to be determined by palpation and auscultation. The bladder should be emptied to make a successful examination. A greatly distended bladder may completely obscure palpation of the fœtal head. To practise palpation, the hands, recently cleansed with hot water and soap, should be laid broadly but lightly upon the abdomen of the patient, the physician standing with his face toward her feet. By gentle pressure with the entire surface of the hands he will be able to recognize a cystic portion of the abdomen on one side, and on the other a solid body, whose long axis is usually parallel with the longitudinal axis of the mother's body. The cystic portion of the abdominal tumor is the fluid within the fœtal membranes, and should an unusual area of cystic tumor be found, the diagnosis of polyhydramnios can be made.

FIG. 1.

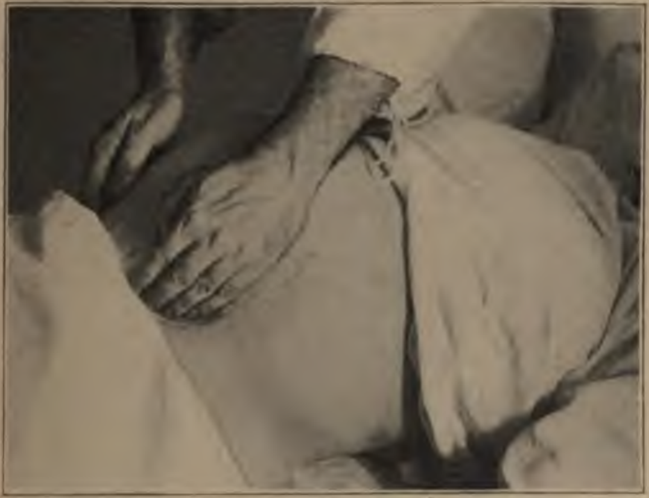


Abdominal palpation outlining the body of the fœtus.

The Fœtus.—By placing the finger-tips parallel with Poupart's ligament on each side, and carrying the hands gently but deeply into the pelvis, the presenting part of the fœtus can be appreciated. If both hands are moved together, first to one side and then to the other, the presenting part can be moved within the grasp of the hands in either direction. In normal pregnancy the head will be found at the brim of the pelvis; the solid portion of the tumor or back of the child is directed obliquely upward and outward toward the mother's left side; the amniotic fluid within the membranes is found beneath the right half of the mother's abdominal wall at the right upper portion of the abdomen with the limbs of the fœtus.

During the palpation of the abdomen and mapping out of the fœtus, the living fœtus will usually be felt to move beneath the hand of the examiner. Fœtal movements are of two kinds: One, a gradual bending of the fœtal trunk, resembling a peristaltic movement; the other, the quick and often forcible movements of the child's limbs. If either of these be positively recognized, it furnishes positive evidence of the existence of pregnancy. These movements are occasionally simulated by muscular contractions in the abdominal wall of the mother, and very rarely by marked intestinal peristalsis.

FIG. 5.



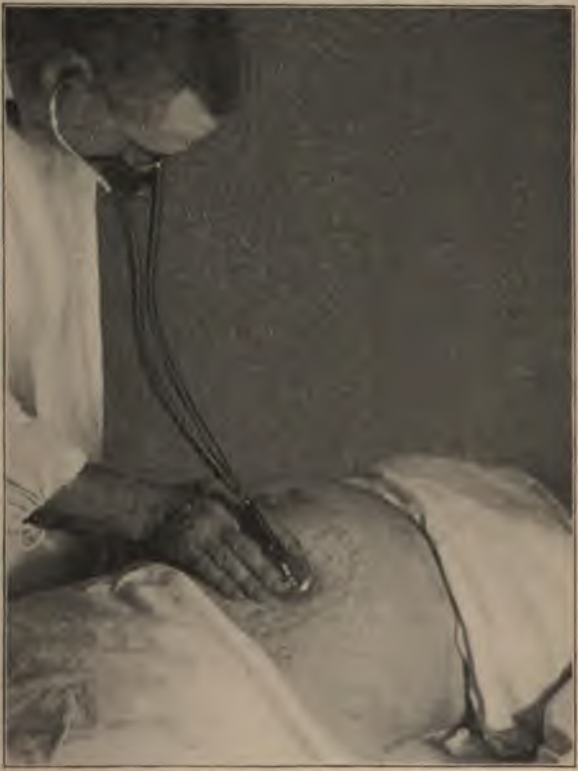
Palpating the presenting part.

When a fœtus has been outlined in the abdomen of the mother, the question next arises, Is this fœtus within the uterus or outside its cavity? Palpation alone will not give a positive answer to this question. In normal, entopic pregnancy, however, the fœtus in the great majority of cases lies in the uterus, with its long axis parallel to that of the mother's body. In abnormal, ectopic pregnancy the fœtus lies transversely or obliquely in many cases. To determine positively whether a fœtus at term is within or without the uterus it is necessary to examine the uterus thoroughly by vaginal examination, and also by ascertaining whether its cavity is empty or whether it is occupied by a fœtus.

While palpating the fœtus, the observer should ascertain the condition of the abdominal walls, as well as their thickness or thinness and muscular development, and that of the round ligaments and any abnormality which may be present in this region. A greatly enlarged liver should be recognized by palpation and percussion, and also an excessively distended condition of the intestines. This is present in the toxæmia of pregnancy, and is a valuable indication of the condition of the patient's digestion. The muscular development of the uterus may be inferred from the firmness of the abdominal wall and the development of the round ligaments. The presence of an abdominal tumor in addition to the pregnant uterus should also be recognized during this examination. Excessive distention of the uterus is a valuable indication pointing to multiple pregnancy or the presence of some pathological condition.

Auscultation: The Fœtal Heart.—Auscultation of the abdomen should next be practised to determine the presence or absence of fœtal heart-sounds. In normal pregnancy these are best heard between the umbilicus of the mother and the anterior superior spinous process of the left ilium. If the sheet covering the patient's abdomen be drawn smoothly over the skin and a stethoscope or phonendoscope be applied gently but firmly, heart-sounds can usually be heard without difficulty after the sixth month. Where the child is small and freely movable, heart-sounds may be heard at any point over the abdomen below the umbilicus and to the left of the median line and the pregnancy still be a normal one. The hearing of fœtal heart-sounds and feeling or seeing the movements of the fœtus give positive information that preg-

FIG. 6.



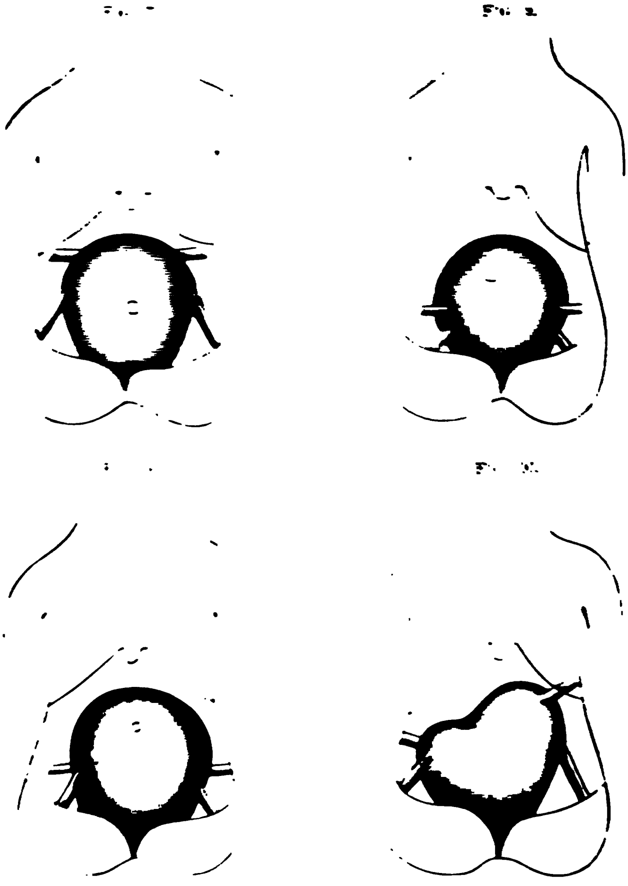
Obtaining fœtal sounds by the phonendoscope.

nancy exists. No other phenomena connected with pregnancy afford positive information upon this point.

Murmur in the Umbilical Cord.—When listening for fœtal heart-sounds, the physician may hear a soft hissing or blowing sound, somewhat resembling the heart-murmurs observed in cases of anæmia, and heard most plainly immediately over the trunk of the fœtus. This sound is nearly as rapid as that of the fœtal heart, and is caused by a constriction in the vessels of the umbilical cord, resulting from the winding of the cord about some portion of the fœtus. It is often difficult to detect, but when observed points to the coiling of the cord about the child. In addition to the sounds made by the fœtus itself, the physician will often hear, in the normal abdomen, gas within the mother's intestine, the beating of the abdominal aorta of the mother, and in the wall of the uterus the rushing of blood through the uterine sinuses at the site of the placenta.

The Placenta.—The diagnosis of the location of the placenta may be more positively made in some cases by palpation. In women in whom the abdominal wall is thin and the uterine muscle relaxed, it is possible to feel the edge of the placenta when it is attached to the anterior wall of the uterus. The sensation is that of a ridge or elevation in the muscular tissue of the uterus. The presence of the placenta also obscures palpation of the underlying fœtal members. Thus, when the placenta is attached upon the side of the uterus, directly above the child's back, it is difficult to outline the shoulder, and in some cases of breech presentation it may be difficult to define clearly the fœtal head. The presence of the placenta is a very considerable obstacle in auscultation, and fœtal heart-sounds are heard but faintly through placental tissue. In cases where heart-sounds are indistinct, the examiner should endeavor to detect the placental *bruit*, whose presence may explain the faintness of the fœtal heart.

The location of the placenta may also be diagnosticated by certain changes in the contour of the uterus, which are present when the placenta is attached near or opposite the orifices of the Fallopian tubes. It has been shown that when the placenta remains in one cornu of the uterus that its development in this location causes corresponding enlargement of that portion of the uterus, and very much alters the shape of the womb from its normal ovoidal form. Not only does the location of the placenta in this region produce this result, but in many cases the placenta in this location is adherent to the wall of the uterus. When labor occurs, the placenta in these cases is not expelled spontaneously, but must be removed by the hand of the obstetrician. It is a question whether the placenta lodges at the orifice of the Fallopian tube, because of some pre-existing endometritis at this point, or whether the lodging of the placenta in this portion of the uterus sets up an irritation which results in its adherence to the uterine wall. The result, however, is practically the same, namely, that in cases in which the placenta remains in the cornu of the uterus adherence of the placenta may be feared when labor occurs. The changes in [illegible] by this condition have been made a careful study, and may be summed up by saying that that cornu of the uterus in which the placenta [illegible] becomes enlarged and exaggerated in contour, so that the shape of the uterus is plainly evident to the touch and eye of the observer.



Variations in shape of uterus in different locations of the placenta. (Palm.)

Situation of the Placenta. The practical value of diagnosticating the location of the placenta before labor is not appreciated in spontaneous births. In natural labor the placenta demands the attention of the obstetrician only to secure its entire expulsion. In cases, however, of low attachment of the placenta its location is a matter of great importance, not only because severe hemorrhage inevitably occurs when the placenta is very near the internal os, but because methods of treatment addressed to this condition are most successful when the obstetrician knows the location of the placenta and can apply his tampon or use his hand directly with reference to this condition. Where it is necessary to remove an adherent placenta, much time may be saved and needless manipulation avoided if the physician can carry his hand at once to the placenta, instead of taking some time to find it within the uterus. In operative cases, where delivery must be performed by abdominal incision, the location of the placenta is of considerable importance. In a considerable proportion of cases from the writer's experience, in fully one-fifth a placenta was attached to the anterior wall of the uterus in such a manner that the incision for the delivery of the child must have come upon the placenta. There is no way of stopping a resulting hemorrhage except by quickly tearing through the placenta and emptying the uterus rapidly of its contents. If the operator is forewarned, he is much less likely to lose time or to be for a moment embarrassed by hemorrhage from the placenta. The diagnosis of the location of the placenta should certainly be made whenever possible, and especially in all complicated cases.

The Placenta in Ectopic Gestation.—In ectopic gestation the location of the placenta is of paramount importance. It is almost impossible in many cases to remove a placenta which has become attached to the intestine, to the mesentery, or to the wall of the abdomen or pelvis, without fatal hemorrhage resulting. If the placenta can be diagnosticated as situated upon the anterior wall of the abdomen, the operator would be justified in avoiding the central line for his incision and in opening the abdominal wall at some point where he could extract the fœtus without necessarily separating the placenta. By stitching the membranes to the margins of the abdominal incision and tamponing the fœtal sac with iodoform gauze, the placenta will be gradually separated, and may be discharged later without serious bleeding. The location of the placenta in ectopic gestation is a matter of considerable difficulty, and can only be accomplished by palpation under an anæsthetic, and patient and repeated auscultation. In cases in which the fœtus has perished, pathological changes in the placenta have taken place to such an extent that hemorrhage is less to be feared than in cases in which the child is living. The diagnosis of the location of the placenta in ectopic gestation with dead fœtus becomes, then, of much less importance.

The Placenta in Multiple Pregnancy.—The location of the placenta is often of considerable difficulty in multiple pregnancy. Here the placenta is often so large, or two may be present, as seriously to embarrass the physician in his efforts to map out distinctly the contents of the uterus. In a patient having thin abdominal walls and a distended uterus, a large, twin placenta may give the impression, on palpation, of the back of a small child; while a joined twin placenta may so cover a small twin as to obscure completely evidence by palpation of its existence. As atony of the uterus is a frequent complication in multiple pregnancy, the location of the placenta is of practical importance, because the obstetrician will probably be required to remove the placenta manually after the delivery of the children.

The Placenta on the Anterior Wall of the Uterus.—In women of frail physique, with thin and poorly developed abdominal muscles and relaxed uteri, the location of the placenta may become a source of considerable discomfort. If the placenta be attached below the umbilicus and above the lower uterine segment, its position need occasion no complications from hemorrhage. During the later months of pregnancy, however, it will form a considerable weight at that portion of the uterus, and may cause the contents of the womb to gravitate against that portion of the uterine wall, producing a bulging of the uterus at that point, with disagreeable sensations of weight and heaviness. In cases where the position and presentation are normal a large placenta attached above the lower uterine segment upon the left side of the uterus may bulge out the wall of the womb, and the combined mass of fœtus and placenta may press against the bowel, favoring obstinate constipation, and give the patient much discomfort. Similar trouble will be experienced where the placenta is attached below the umbilicus, but above the lower uterine segment upon the right side of the abdomen. The treatment for this condition consists in the use of a properly adjusted abdominal supporter. A patient is often more comfortable when employing an article of domestic manufacture than when wearing a more complicated and expensive form of bandage, many of which contain silk and rubber. The best material for such a support is flannel, and in cases where the patient is greatly troubled by laxity of the entire wall of the abdomen a body made of flannel, and supported from the shoulders, will often give great relief. It occasionally happens that in such cases the mother becomes apprehensive that the child has perished, because the placenta may be so attached as to obscure some fœtal movements; the physician's examination is usually quite sufficient to dispel such anxiety.

The Period of Gestation.—To determine the period of gestation, the physician observes the location of the fundus of the uterus. By reviewing the rate of development of the pregnant uterus we find that, clinically speaking, it becomes first appreciable on abdominal examination at the fourth month, when it can be distinctly felt at the brim of the pelvis. At the fifth month it is midway between the umbilicus and the pelvic brim; at the sixth month it is at the umbilicus; at the seventh, two fingers' breadth above it; at the eighth, a hand's breadth; at the expiration of the ninth it has risen to distend the tissues beneath the tip of the sternum, whence it descends before labor, until it is again a hand's breadth above the umbilicus. To one who is experienced in palpation of the abdomen in pregnancy the diagnosis of the period of gestation may be made more certainly than by computing the period from the date of the last menstruation. We have several times had occasion to correct patients' calculations by such examination, and have spared them unnecessary anxiety, and, again, have directed them to summon the nurse and to prepare for confinement, which they had not expected for several weeks or a month or more.

CHAPTER IV.

THE COMPLETE EXAMINATION OF THE PREGNANT PATIENT.

In order to understand all that should be ascertained in the examination of a patient at term, we must refer to the situation of the fœtus in the mother's body.

Presentation.—Some portion of the fœtus is nearest to the outlet of the birth canal during the latter months of pregnancy. This portion presents during labor, and the description of this situation of the fœtus is that of its presentation. Usually the fœtus sinks as the embryo becomes a fœtus, with the head lowermost, and hence most presentations are those of the head. The shape of the head and of the pelvis is such that the vertex or occipital portion of the head is that which is usually lowest and presents, hence most presentations of the head are those of the vertex or occiput. In some cases the face may present. The fœtus can readily be accommodated in the mother's body if its long axis is parallel with that of the mother's body; hence the breech of the fœtus may be lowest and breech presentation may be present. Rarely the child is situated in the mother's body transversely, and then one or other of the shoulders presents, and what is called a shoulder presentation is present. The following presentations of the fœtus are usually found:

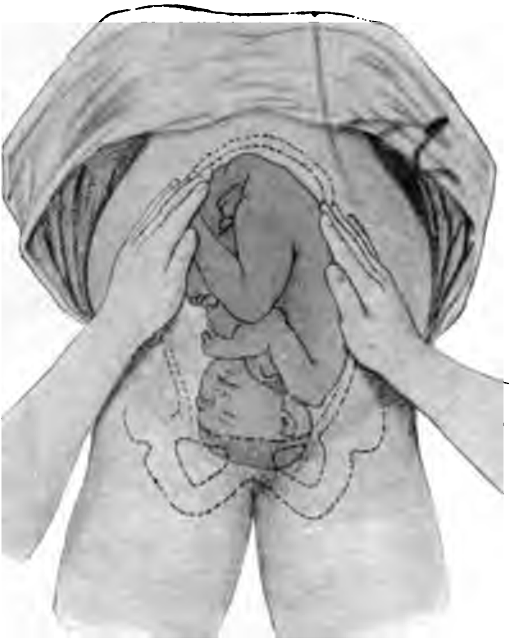
The vertex.
The face.
The breech.
The right shoulder.
The left shoulder.

Unusual Presentations.—If the mechanism of labor does not proceed naturally, the fœtus may present in an unusual manner. Instead of the vertex or face, the forehead may present, and a brow presentation be present. In some cases the head turns across the pelvis, and a presentation of the side of the head or parietal bone may occur. Instead of the breech, the legs and feet may present, and a foot presentation be present. Instead of the shoulder alone, the child may become so twisted within the womb that a shoulder and one of the lower limbs may present, but these are variations from the usual presentation and are not often found.

Unusual presentations:
Brow presentation.
Parietal bone presentation.
Foot presentation.
Complicated presentation of extremities.

Positions.—The presenting part of the fœtus has a definite relation to the mother's body. It is directed toward the right side or the left side of the mother's body, or directed anteriorly or posteriorly. In most cases those positions and presentations in which the back of the child is directed toward the mother's left side are called first positions. Those in which the back of the child is directed toward the mother's right side are called second positions. This applies to presentations of the head and breech. In transverse presentations, the position is named in accordance with the shoulder which is presenting, and whether it is turned in front or behind.

FIG. 11.



First position. (LEOPOLD.)

FIRST POSITION.—Back of the child to the left side of the mother's body.

SECOND POSITION.—Back of the child to the right side of the mother's body.

Anterior positions apply to shoulder presentation, positions and presentations being named from shoulder presenting and its anterior or posterior position.

When the mechanism of labor is considered, it will be seen that cases in which the presenting part is not in front may be more rationally considered as instances of defective rotation than as separate positions. The multiplication of positions of the fœtus is well exemplified in the French literature of obstetrics. Following the example of the French, early American teachers, educated abroad, adopted a nomenclature modelled upon theirs. Those who have

The Placenta on the Anterior Wall of the Uterus.—In women of frail physique, with thin and poorly developed abdominal muscles and relaxed uteri, the location of the placenta may become a source of considerable discomfort. If the placenta be attached below the umbilicus and above the lower uterine segment, its position need occasion no complications from hemorrhage. During the later months of pregnancy, however, it will form a considerable weight at that portion of the uterus, and may cause the contents of the womb to gravitate against that portion of the uterine wall, producing a bulging of the uterus at that point, with disagreeable sensations of weight and heaviness. In cases where the position and presentation are normal a large placenta attached above the lower uterine segment upon the left side of the uterus may bulge out the wall of the womb, and the combined mass of fœtus and placenta may press against the bowel, favoring obstinate constipation, and give the patient much discomfort. Similar trouble will be experienced where the placenta is attached below the umbilicus, but above the lower uterine segment upon the right side of the abdomen. The treatment for this condition consists in the use of a properly adjusted abdominal supporter. A patient is often more comfortable when employing an article of domestic manufacture than when wearing a more complicated and expensive form of bandage, many of which contain silk and rubber. The best material for such a support is flannel, and in cases where the patient is greatly troubled by laxity of the entire wall of the abdomen a body made of flannel, and supported from the shoulders, will often give great relief. It occasionally happens that in such cases the mother becomes apprehensive that the child has perished, because the placenta may be so attached as to obscure some fœtal movements; the physician's examination is usually quite sufficient to dispel such anxiety.

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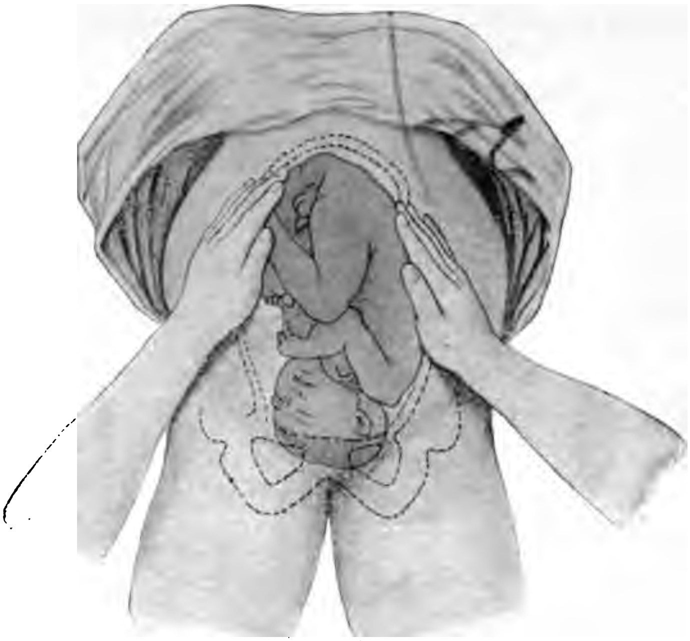

First position. (LEOPOLD.)

FIRST POSITION.—Back of the child to the left side of the mother's body.

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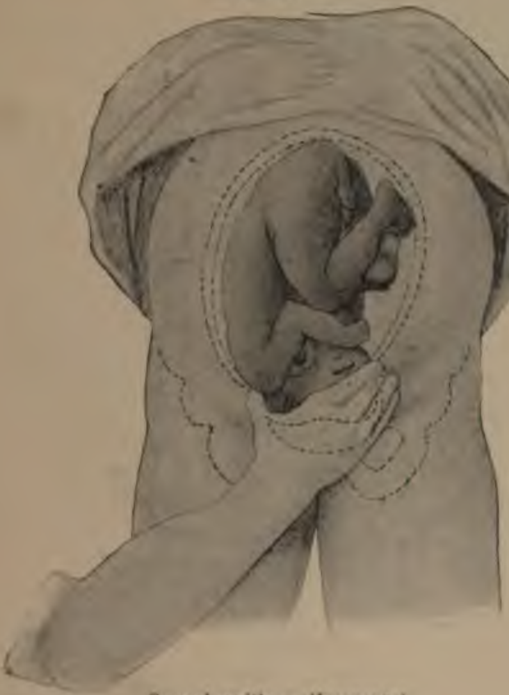
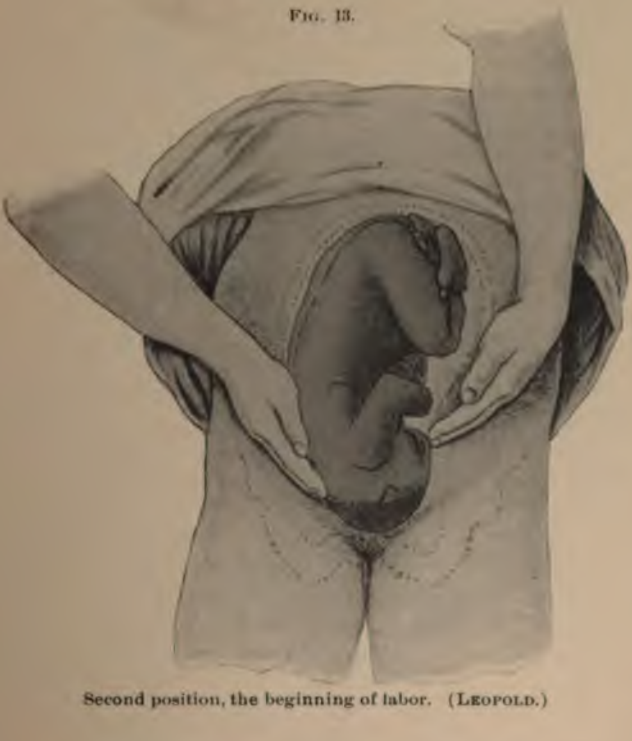
Fig. 12.



Second position. (Leopold.)

Fig. 13.



Second position, the beginning of labor. (Leopold.)

studied obstetrics in German hospitals, and are familiar with the German literature upon the subject, appreciate the simplicity of the nomenclature which considers but two positions of the fœtus in the various presentations.

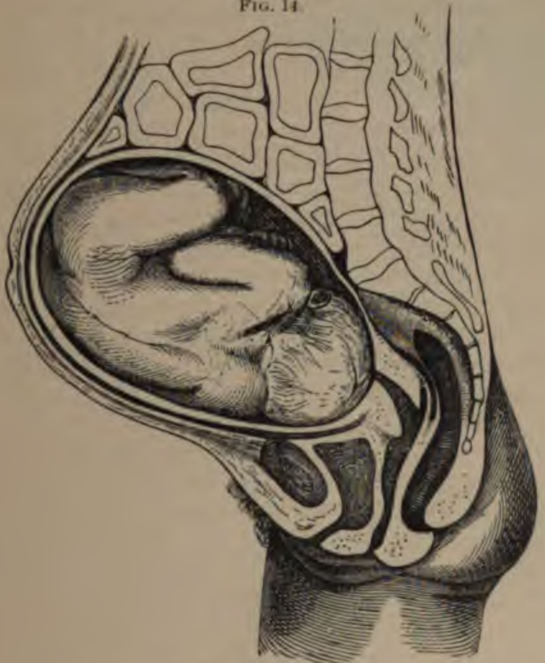
First Position, Vertex Presentation.—The most usual position of the fœtus is outlined by palpation as that already described, in which the back is directed to the left side of the mother's abdomen, midway between the umbilicus and the crest of the ilium, the head being at the brim of the pelvis, the occiput directed to the left of the antero-posterior diameter of the pelvic brim, the knees and feet of the child in the right hypochondrium, the upper extremities at about the level of the umbilicus and a little to the right of the median line.

In rare instances the back of the child lies upon the left side of the mother's abdomen, but directed toward the posterior wall of the abdomen. The head is at the brim of the pelvis, the occiput directed posteriorly to the transverse diameter of the pelvic brim, but toward the left side of the pelvis. In either of these cases the position of the fœtus may be called the first. The presentation when found, as described, by palpation, is occipital. In normal cases the attitude of the fœtus is that of universal flexion; the head is flexed upon the trunk, and the limbs are also flexed and partially folded across the body. In patients in whom the muscular walls of the abdomen are thin this flexed position of the fœtal limbs may be distinctly outlined by palpation. In palpating the head the physician will notice that the smooth, rounded surface of the occiput points obliquely downward at the pelvic brim, and that between this and the trunk of the child there is a groove into which oftentimes the fingers may be pressed. When the fœtal head is but partially flexed, or is extended, this groove is partially or wholly obliterated, and the occiput and the back of the child seem practically continuous.

Multiple Pregnancy.—Multiple pregnancy may be diagnosticated by palpation, when two or more large fœtal parts may be distinctly appreciated; by this we mean when two heads can be distinctly outlined, or two breeches; when two heads and one breech, or two breeches and one head, can be mapped out, such a condition can only be caused by multiple pregnancy.

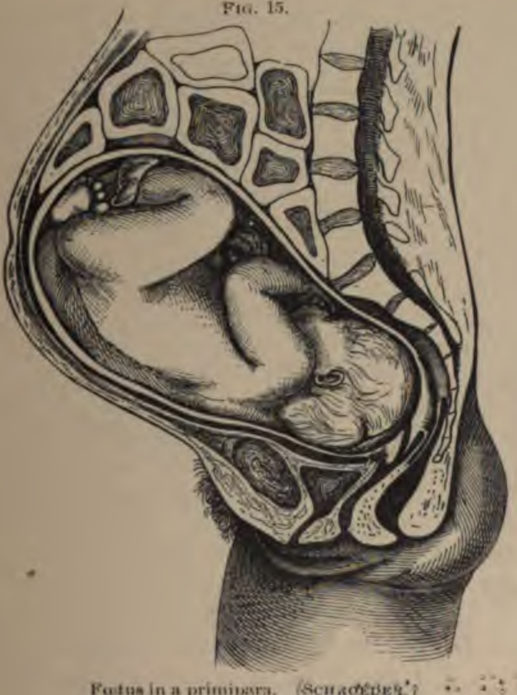
Primiparity or Multiparity.—The question as to the primiparity or multiparity of the patient is to be determined by the manner in which she carries the fœtus and the firmness or laxity of the uterine and abdominal muscles. The primipara carries the fœtus lower in the pelvis during the last weeks of pregnancy than does the multipara. This is owing to the greater firmness and elasticity of the uterine and abdominal muscles in the primipara, which have not been weakened by previous pregnancies. Palpation will disclose the fact that the head is at the brim of the pelvis and has begun to fit into the brim, in the primipara; when in the multipara, at the same period of gestation, the head can be found freely movable above the pelvic brim. The shape of the abdominal tumor is different in primiparæ and in multi-

FIG. 14.



Fœtus in a multipara. (SCHROEDER.)

FIG. 15.



Fœtus in a primipara. (SCHROEDER.)

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para, in the former the uterus being pear-shaped or ovoidal, while in the latter the width of the uterus is greater and its outline less symmetrical.

The Pelvis.—In estimating the size of the mother's pelvis a distinction is to be made between a critical examination of the pelvis from the standpoint of the anatomist and such an examination of the pelvis as is possible to the clinician in the practice of obstetrics. The statements are often made that American women rarely have contracted pelves, and that the practise of pelvimetry is not necessary except among women evidently the subject of disease of the skeleton, many of whom are of foreign birth. These statements are, unfortunately, incorrect: for while it is true that but few women of American birth, born amid the better hygienic conditions which have so far prevailed in America, have highly contracted pelves, it is also true that many American women of all classes of society have pelves differing from the normal size, and that these differences are sufficiently great to influence the course and the results of labor. The writer found, in examining 1,224 patients, that 32 per cent. had pelves varying considerably from the average; 25 per cent. had contracted pelves, and 7 per cent. pelves larger than the average.[*] It is comparatively easy to appreciate a high grade of pelvic contraction, but it is equally important for the interests of the patient that a minor degree of pelvic abnormality, which may result in fatal injury or death to the fœtus and injury to the mother, should be recognized before the actual beginning of labor.

Landmarks for External Pelvimetry.—The bony pelvis in the living patient presents a sufficient number of external landmarks, always accessible, to enable the obstetrician to determine the presence or absence of any important abnormality of the bony pelvis. These landmarks are the anterior superior spines of the ilia: the widest points of the crests of the ilia: the posterior superior spines of the ilia: the spine of the last lumbar vertebra: the middle of the anterior surface of the pubic joint, and the trochanters of the femora. These points may be utilized for pelvimetry, and from measurements so taken we become aware of the presence or absence of any abnormality necessitating a more critical examination.

Postures for Examination.—The postures necessary for the patient to assume in order to permit such measurements to be taken are lying on the back, turning partially upon either side, and turning entirely upon the side for a few moments only. It is occasionally advantageous to measure the pelvis while the patient stands. This posture is usually employed in cases in which there is reason to suspect contraction of the pelvic brim. It is a familiar observation that pregnant women cannot lie flat upon the back with comfort: the pressure of the pregnant uterus and its contents upon the spinal column and abdominal viscera seems to be such that the patient instinctively shifts the weight from one side or other of the spinal column. This tilting of the pelvis to one side, which renders her position upon a bed or table comfortable, need not embarrass the physician in the practise of pelvimetry. A little experience will enable him to outline the landmarks beneath the thin linen sheet which covers them, and so long as he is careful to keep with the eye the central line of the patient's body he need not be confused in making a measurement.

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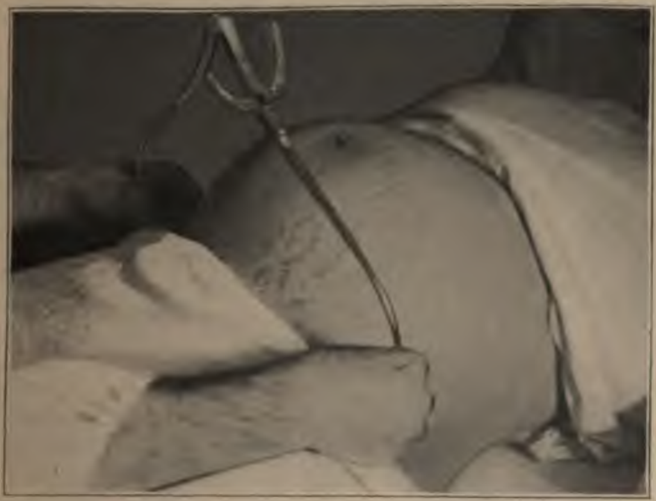
[*] Davis: American Journal of Obstetrics, Vol. 41, No. 1, 1900.

Pelvimeter.—The obstetric pelvimeter is a pair of calipers with a scale graduated in centimetres or inches, or both. The important part of the instrument is the scale, which requires good workmanship. The curve of each limb of the pelvimeter should be sufficiently great to permit a measurement from the posterior iliac spine of one side of the patient's pelvis to the anterior superior of the other. The instrument should be made of well-tempered steel, nickel-plated, and should be made to take apart for convenience in transportation.

In practising pelvimetry the physician grasps the pelvimeter in such a manner that his thumb and finger rest just above the termination of each limb of the pelvimeter. He should remember to take his measurements from the outer side of each landmark upon the ilia. There is no good reason for this injunction, except the fact that such is usage, and that the measurements given by those who have examined large numbers of pelves are measurements obtained in this manner.

FIG. 16.

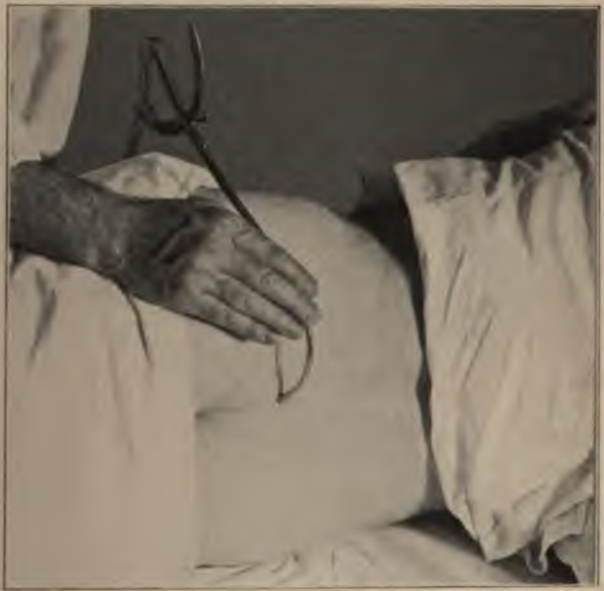


External pelvimetry—taking the transverse diameter of the pelvis.

The Size of the Average Pelvis: The Brim.—The distance between the anterior superior spines of the ilia is found to be, in the average pelvis, 26½ cms. or 10 inches; the distance between the outermost points of the crests of the ilia is 28 cms. or 11 inches; between the trochanters is normally found to be 32 cms. or 13 and a fraction inches. These are measurements giving the width of the pelvis, and the relationship existing between them is of practical importance. Thus, in cases where the proportion between the first two measurements is lost or is reversed further examination will show that disease of the skeleton is present.

The oblique measurements of the pelvis, which may be made upon the living patient, are taken from the posterior superior iliac spine of one side to the anterior superior iliac spine on the other. There is normally a slight difference in these measurements, owing to the fact that the right oblique diagonal of the bony pelvis is often a little larger than the left. This diagonal—the right oblique—normally measures from 22 to 23 cms., while the left, from the left posterior superior spine of the ilium to the right anterior superior spine, measures 22 to 22½ cms., or 8¾ inches. To make the oblique measurements at the brim of the pelvis the patient should lie, not upon the back, but turned, raising slightly the side whose oblique measurement is desired. Even in fat women it is possible to outline these landmarks sufficiently plainly to enable the measurements to be taken.

FIG. 17.



External pelvimetry—measuring the external antero-posterior of the brim.

The Antero-Posterior Measurement of the Pelvis and the Externa Conjugate: THE EXTERNAL CONJUGATE.—The external conjugate of the pelvis, sometimes known as Baudelocque's conjugate, is measured from the depression beneath the spine of the last lumbar vertebra to the middle of the anterior surface of the public joint, 20½ cm. or 8 inches.

THE INTERNAL CONJUGATE.—The internal conjugate, sometimes called the true conjugate, is the distance from the promontory of the sacrum to the posterior surface of the pubes at its upper edge. It is evident that this cannot be directly obtained in the living patient without considerable difficulty. We approximate this measurement by measuring from the promontory of the sacrum to the under edge of the pubic joint, and then deducting the height of the pubes. In this way we obtain the measurement desired. This requires vaginal examination, and is usually done as follows: The bladder and the rectum of the patient being empty, she is placed upon her back at the edge of the bed or table, with the buttocks projecting slightly over the edge. The limbs are supported comfortably, and the surface of the abdomen should be free from constriction by clothing. The hands of the physician are made aseptic, and the fingers of one hand are anointed with a sterile ointment. The first and second fingers of one hand are then inserted into the vagina, and passed directly backward until they come in contact with the posterior pelvic wall and the anterior surface of the sacrum. The elbow of this arm is then lowered and the fingers passed upward along the hollow of the sacrum, pushing the cervix to one side until the promontory is reached. The patient should be asked to open the mouth widely, and to avoid straining during this manipulation. When the longest finger touches the promontory of the sacrum, a finger of the other hand should be put upon the internal hand at the lower border of the pubes, where the hand comes against the subpubic ligament. This point should be marked by holding the finger upon it or in any other way. The internal hand should then be withdrawn and the distance between the tip of the long finger and the point marked near the knuckle should bé measured by a pelvimeter or tape measure. In the average pelvis this will be found to be 13 to 13½ cm.; 2 cm. are deducted for the thickness and average height of the pubes, and unless the observer finds by palpating the pelvis that it is thicker and higher than the average, this may be taken as the usual measurement. If this be deducted from 13½ cm., it gives 11½ cm., the usual measurement of the internal conjugate.

The Instrumental Measurement of the Internal Conjugate.—Instruments have been devised for measuring the internal antero-posterior diameter. Wallenbergh's method was made possible by Van Huvel's instrument and the same principle subsequently carried out by Skutsch.[9] These instruments contain an arm which passes within the vagina to the promontory of the sacrum, a second arm which passes to the pubes, and a scale by which the conjugate can be estimated. Various modifications of these instruments have been made, among them that of Neumann and Ehrenfest.[10] Their instruments consist of three limbs introduced within the pelvis, one passing behind the pubes, one to the promontory, and one to the middle of the posterior pelvic wall. The outer extremities of these limbs form three parallels, and from these parallels, and angles derived from them various measurements of the internal pelvis are derived.

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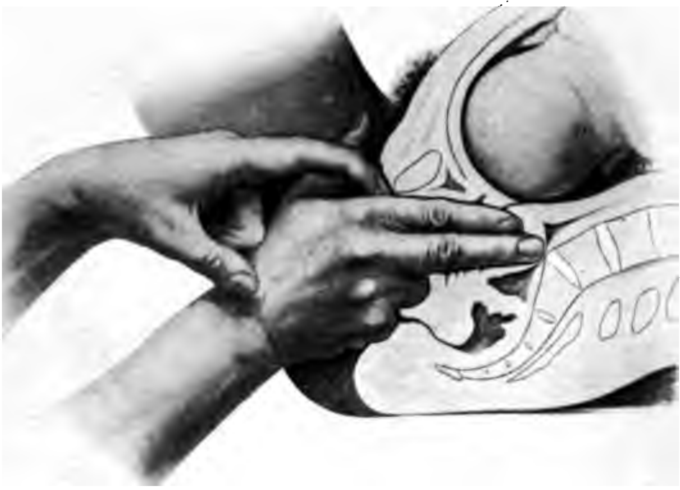
[9] Die Beckenmessung an der lebenden Frau, Jena, 1886—Skutsch, Die praktische Verwerthung des Beckenmessung, Deutsche Medic. Wochen. 1890, Nr. 13, und 1891, Nr. 21.

[10] Monatschrift f. Geburtshülfe u. Gyn. Band XI, Heft., pp. 237-253, 1900.

FIG. 18.



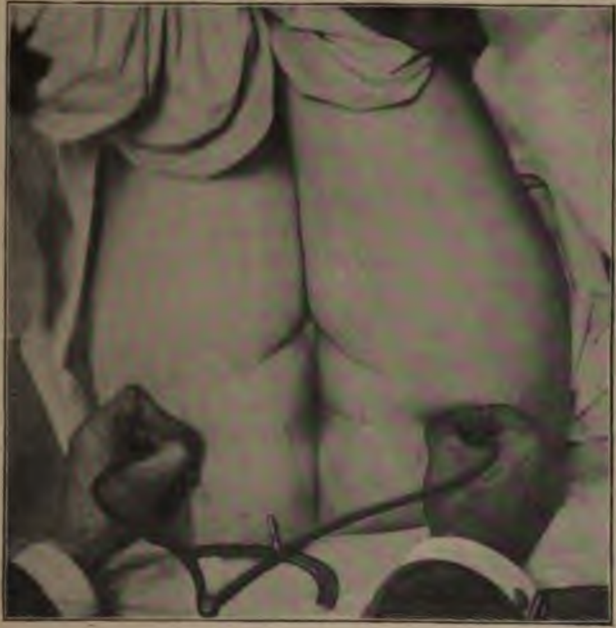
Measuring the Internal Conjugate. (BUMM.)

Circumference of the Pelvis.—The circumference of the pelvis is to be measured by passing a tape-line about the patient, passing the measuring-line about the middle of the pubic joint, just below the crests of the ilia, and across the upper portion of the sacrum behind; this measures normally from 85 to 90 cms. If the measurements just described are taken and found to be of average extent, it may almost certainly be concluded that the pelvis is of average size.

The Pelvic Outlet.—Cases are sometimes met with in which a transverse contraction in the outlet of the pelvis occasions delay and difficulty in labor. The most important transverse diameter at the pelvic outlet is the distance between the tuberosities of the ischia. This distance can be measured by external examination by placing the patient upon her back at the edge of a bed or table and having her legs and thighs flexed and supported by an assistant. If help is not available, the patient may simply bend the lower extremities, resting her heels upon the bed. The physician then measures across between the tuberosities of the ischia, which can be readily located by pressing the thumbs firmly against these bony landmarks. The distance thus obtained gives an excellent indication of the transverse width of the pelvic outlet.

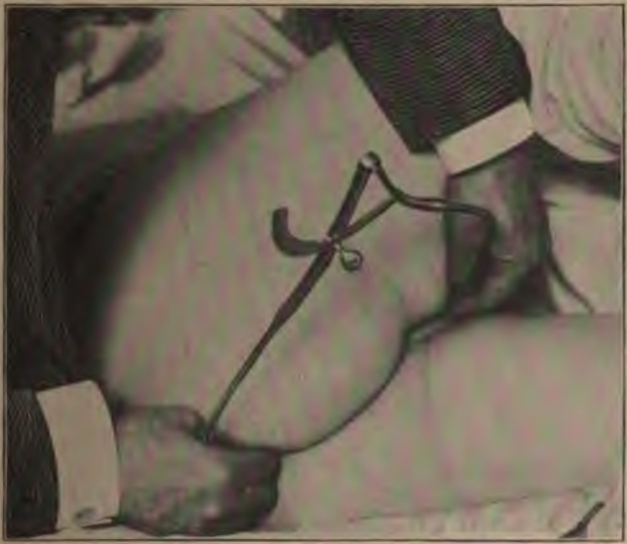
[illegible]he sacro-coccygeal joint in most patients permits of backward motion of the coccyx, which enlarges the outlet of the pelvis in its antero-posterior diameter from one-half to three-fourths of an inch.

FIG. 19.



Measuring between the tuberosities of the ischia. Legs of patient raised by an assistant.

FIG. 20.



Measuring from pubes to coccyx.

In middle-aged women and in patients in whom the process of ossification takes place early and to a considerable degree, the mobility of this joint may be much impaired or lost. In contracted pelves the coccyx may be carried further forward than is normal, and the result be considerable difficulty in the extraction of the child at the pelvic floor. In cases where pelvic abnormality is suspected the physician should obtain this measurement by turning the patient upon the side, and by measuring from the lower edge of the subpubic ligament to the sacrococcygeal joint with a pelvimeter. The subpubic ligament in most patients is so large and firm that its edge presents a distinct ridge beneath the pubis, and can be readily found. To locate the coccyx it is but necessary to follow down the sacrum in the cleft between the nates, when the coccyx can be readily found.

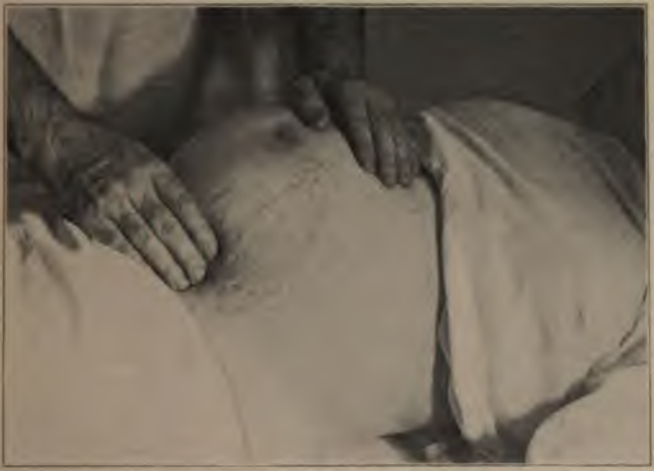
Measurements of the pelvic outlet are rarely necessary in cases in which the measurement of the pelvic inlet reveals no abnormality. If the sacro-coccygeal joint be ankylosed, the condition cannot be remedied before labor, and in delivery with forceps the ankylosis will yield during the extraction of the fœtus. If the coccyx should be found bent strongly upward and forward, and fixed in that position, its removal would be justifiable during pregnancy. It is rare, however, for any complication to result from injury to this joint during labor.

Palpation of the Pelvic Cavity.—It would be of great value to the obstetrician to determine by external examination, or by any method of direct measurement, the actual capacity of the pelvis. This, however, cannot be satisfactorily done by any method of examination which is practicable in the ordinary experience of obstetric work. The presence of any abnormality in external measurements justifies the physician in making a thorough internal examination. If he has had experience in such examinations in patients who are not pregnant, he has had occasion to become somewhat familiar with the contour of the normal pelvis. An observant physician will at once appreciate marked abnormalities in a deformed pelvis by palpation through vaginal examination. The important measurement of the antero-posterior diameter is readily made in contracted pelves, and gives the most important data to be thus obtained. Lateral and oblique contractions of the pelvic cavity can be appreciated by the hand of an experienced observer, but cannot be accurately measured. Fortunately, indications for treatment cannot be based upon a given number of inches or centimetres, while sufficient information can always be obtained regarding the size and contour of the pelvis to afford a safe and logical basis for a practical decision.

Relative Size of the Pelvis and Fœtus.—The absolute size of the pelvis is not, however, the problem which engages the attention of the practical obstetrician. He is most concerned in knowing what is the relative size of the fœtus and the pelvis of the mother. By palpation he learns the attitude and location of the fœtus, and is able to ascertain that it is not excessive in size nor developed as a monstrosity. By pelvimetry he ascertains that the mother's pelvis is of the average dimensions and symmetrically developed. During this examination he has had abundant opportunity to inform himself regarding the muscular development of the mother, the strength and elasticity of the uterus and abdominal walls, and the presence or absence of any pathological condition in the abdomen which might hinder delivery. There remains for the physician a final investigation as to the relative size of the fœtus and the mother. If the fœtus be found in its presenting part proportionate in dimensions to the mother's pelvis, this fact, together with the knowledge just described, will enable the physician to make a prognosis regarding the labor. Where all factors in the problem are found to be normal, the conclusion is certainly justified that a normal labor, or one very closely approaching it, is to be expected.

To ascertain the relative size of the fœtus and the pelvis, the presenting part of the fœtus should be gently but firmly fitted into the pelvic brim by pressure applied to the fundus of the uterus, and at the same time by pressure exerted upon the presenting part. The physician may take the presenting part, usually the head of the fœtus, between his hands, in the manner already described in palpation, and carry it gently downward and backward until he finds it beginning to fit into the pelvic brim. He may also stand facing the patient, and, taking the head in the right hand between the thumb and fingers, he places his left hand upon the fundus of the uterus. While he carries the head downward and backward with the right hand, with the left he brings the uterus gently downward toward the brim of the pelvis, thus favoring the engagement of the presenting part.

FIG. 20



Abdominal palpation—fitting the presenting part into the pelvic brim.

With either method the results are sufficiently striking to one who practises such examinations to be of great interest. In cases where no disproportion exists the head comes readily to the pelvic brim, and under gentle pressure fits gradually within the brim of the pelvis with but little inconvenience to the mother. Where relatively slight disproportion is present, the head does not easily enter the pelvic brim, but the right parietal bone moves downward and forward, the head remaining transversely at the pelvic brim. In marked disproportion between the pelvis and the head, the head remains unmistakably above the brim of the pelvis, and, if pressure be continuous and forcible, the head turns with a partial rotation to one or other side, the fœtus finally lodging upon the brim of the pelvis or in one iliac fossa. In cases where slight pelvic contraction is diagnosticated, if the patient be excessively nervous and complains of pain under any manipulation, it is better to anæsthetize her and thoroughly ascertain the relative size of the fœtus and the mother rather than allow the case to go on.

The Prognosis of Labor.—The prognosis regarding the labor should be always guarded, as stated to the patient: if no abnormality be detected, there can be no objection in saying to her that no reason is found for apprehension regarding her confinement; where, however, some abnormality is discovered, it is well not to alarm the patient by stating this to her until the physician has decided whether he intends to interrupt the pregnancy. If this be necessary, it can be stated to the patient that it is best, in the interests of the child, that labor come on.

The Complete Examination.—In general, in conducting such an examination, it should be remembered that a distended bladder may often greatly interfere with palpation, and lead the examiner into serious error. A large accumulation of fæces in the lower bowel is less likely to cause a mistake, although it is an unfavorable condition for an accurate examination. While anæsthesia is very rarely necessary, yet there should be no hesitation in putting the patient under the influence of a suitable anæsthetic rather than attempt to make a diagnosis without suitable examination.

In completing the physical examination of the pregnant patient the physician will not discharge his duty unless he has carefully investigated the quantity of urine passed, its composition, and also the amount of solid excreta which the patient voids. To ascertain the quantity of urine passed, in hospital practise nurses in attendance can easily supply the requisite information; with private cases it is best to choose some common utensil whose capacity is known and to have the patient report from time to time the quantity of urine passed in twenty-four hours, using this as a measure. The examination of the patient's urine should be so conducted as to give information regarding its color, reaction, specific gravity, and the presence or absence of albumin, sugar, urea, pus, blood; by microscopic examination the presence of casts and their variety, the presence or absence of bacteria, and any other solid ingredients of the urine should be carefully noted. It is also of great practical importance to estimate the amount of urea and of solids which is excreted. A detailed account of the methods of clinical investigation which have been most successful in making such an examination of the urine will be given in that portion of the book describing the toxæmia of pregnancy and its treatment.

The Examination of the Blood.—In treating of the diagnosis of early pregnancy we have already described some of the changes found in the blood during pregnancy. In advanced pregnancy the examination of the blood is especially valuable, in giving information regarding the presence or absence of anæmia, which may seriously complicate the pregnant state. Leucocytosis is often present during pregnancy, but an extensively depraved condition of the blood must be considered as abnormal and demanding attention.

The Eyes.—If the patient has noticed distinct impairment of vision during pregnancy, the eyes should be examined. It is unusual for serious conditions to develop except in the most severe cases of toxæmia, but the suspicion of chronically impaired vision should lead to examination.

The Teeth.—Very few pregnant patients escape changes in the teeth. If these be taken in time, temporary fillings may readily be applied, preventing softening and the loss of teeth. If the condition be neglected, the patient may suffer severely.

Changes in the Breasts.—The changes in the breasts vary in accordance with the complexion of the patient and her primiparity or multiparity. In brunette patients the deposit of pigment in the areola about the nipple is pronounced in proportion to the patient's complexion. In blonde patients there is sufficient to draw attention to the condition, although pigmentation is much less than in the brunette. In addition to changes in color, the follicles in the areola are developed, appearing like small globular or seed-like bodies beneath the skin, the breasts grow larger and firmer, the nipples are sensitive, and fluid is usually present. Changes in the breast are most pronounced in primigravidæ, and occur with less distinctness in multigravidæ. They should always be looked for, and in obscure cases give valuable aid in diagnosis.

When the physician has the co-operation of a trained and intelligent nurse, he may request her, at the patient's convenience, to inspect carefully the breasts and nipples. A well-trained nurse, who has had experience in obstetric practise, can accurately ascertain the shape, size, and consistence of the breasts, the presence or absence of fluid in them, and the shape, development, and condition of the nipples. A prognosis cannot be given regarding the puerperal state and the welfare of the child unless a careful survey of the breasts is made. In the absence of such assistance as that rendered by a nurse the physician should not omit this portion of the examination, but conduct it carefully himself.

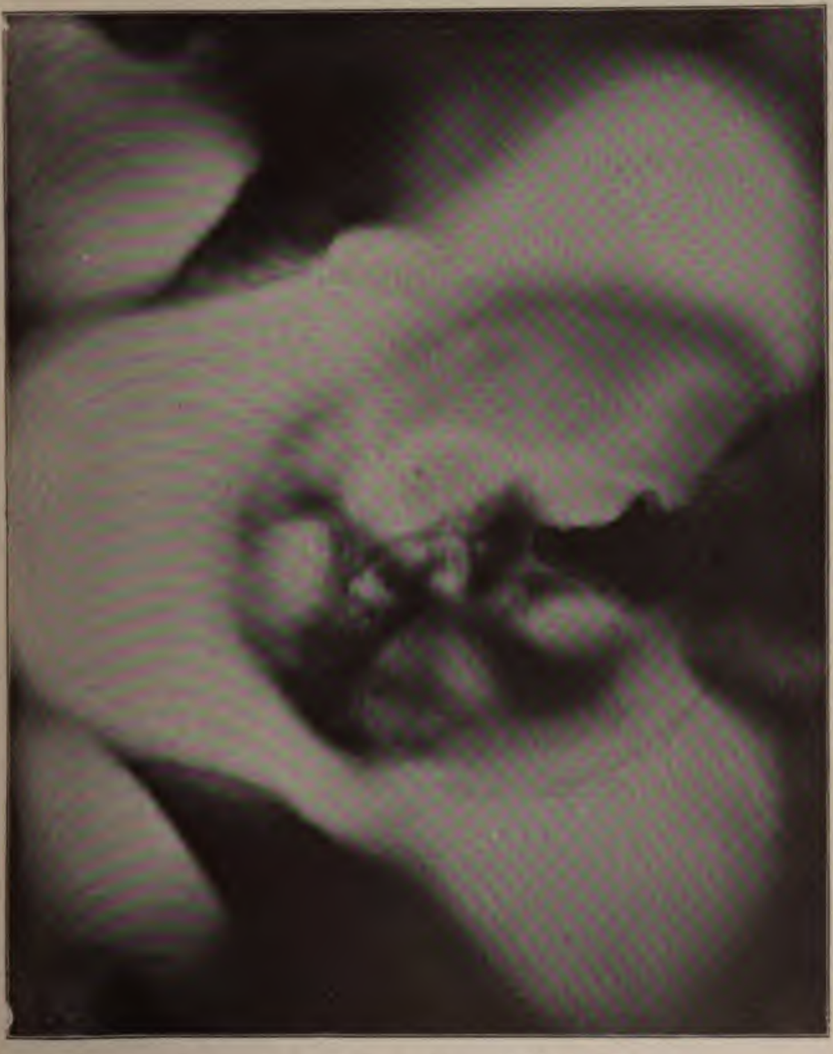
During the half or three-quarters of an hour occupied in the examination of the patient just detailed an intelligent physician will have gained information of the greatest practical value regarding his patient, and will be far better prepared to assume her care during labor and the puerperal state than if he were not in possession of such information. We have yet to find that such a procedure is objected to by any but the most ignorant patient: on the contrary, among intelligent women it often serves to impress the patient with the knowledge and cleverness of her physician, and to increase the confidence which, in her condition of timidity and apprehension, the pregnant patient naturally desires to feel in her attendants.

Obstetric Diagnosis by the Application of the Röntgen Rays. **The Apparatus Needed.**—While much of the apparatus necessary for this work is expensive and complicated, it may be so simplified that large hospitals having an electric-light apparatus may readily fit up a room in which this method of study can be utilized. The apparatus required consists of eight to a dozen storage-cells, each having an electromotive force of about two volts and a capacity of about 150 ampère-hours. The electric force required should be sufficient to give a spark six inches long between the points in air at the breaking of a primary current; this current should be passed through an inductorium or coil 14 inches long and 8 inches in diameter. An electromotive force of from 12 to 15 volts is that usually required. It will be readily seen that a current used by a city for lighting purposes cannot be directly connected with the coil, the force being much too great. A shunt of some sort must be introduced, and this is the purpose of the storage-battery.

A suitable current having been obtained, a most essential part of the apparatus is the vacuum-tube, commonly known as a Crookes tube. This consists of a vacuum-tube of glass, into which are inserted four aluminium electrodes, one of which is a straight wire, the other a flat disk, preferably of platinum. The most efficient electrode for this purpose is the cathode, formed by platinum wire projecting into the bulb. When the current is so arranged that this electrode becomes cathodal, the surface of the tube is phosphorescent, and gives forth abundant rays. If the object to be studied is placed from 12 to 18 inches from the tube upon a photographic plate, perfectly sealed in a pasteboard or wooden holder, the rays permeate the object and the plate-holders, throwing a shadow of the impermeable portions of the object upon the photographic plate. For successful working of the apparatus a high vacuum must be present in the tube. Some think that uranium glass is the best material for the construction of the tube, while it is generally agreed that the thinner the wall of the tube the better the results obtained. Different observations show that penetrating power is sometimes gained by the use of a leaden diaphragm, and that results vary in proportion to the nearness of the object to the tube employed, the electromotive force, and the vacuum in the tube.

The Time Required.—The time necessary to procure a picture varies greatly. An hour has been necessary in some cases, while from a few minutes to fifteen or twenty have given excellent results in others. The time required seems proportionate to the thickness of the object, the vacuum in the tube, and the electromotive force.

PLATE I.



Pelvis and Fœtal Skull, taken with Röntgen Rays.

The Application of the Plate.—The application of the plate to the patient is necessary in studying the trunk of the body; thus, in observing the pregnant womb the plate in its holder should be bandaged upon the abdomen of the patient, as near to the fœtus as possible. In ordinary positions and presentations the plate should be applied to the left side of the mother's abdomen, as near to the brim of the pelvis as possible. The patient should lie upon a suitable table or bed, her abdomen covered by a sheet only. The vacuum-tube should be placed as near the right side of the abdomen as possible, the plate being applied upon the opposite side. An exposure of an hour has sufficed, in the writer's experience, to give an outline of the body of the fœtus within the womb of the mother. The knowledge of the position and presentation so obtained was subsequently verified at the time of labor and found to be correct.

In diagnosticating the position of the fœtal head difficulty will be experienced in passing the rays through the bony pelvis if the head has entered the pelvis. This, however, is of secondary importance, as those cases in which the head can enter the pelvis are not those which occasion anxiety or especial difficulty in labor. (Plate I.)

Development of the Plates.—The photographic plates are developed in the ordinary way, and the best results are obtained by the most sensitive dry plates. The time ordinarily required for the development of such a plate is from fifteen to thirty minutes, and the entire time necessary to secure a picture of the contents of the uterus varies from three-quarters of an hour to an hour and a half. The writer was unable to observe that the passage of the rays through the uterus had the slightest effect on mother or child, the mother's pulse remaining unaltered and the child showing no evidence of disturbance.

The Application of this Method.—It is evident that this method of study, when applied to the pregnant uterus, would be especially useful in cases of multiple pregnancy, of pregnancy complicated by tumors of the abdomen, and of pregnancy in highly contracted pelves, where it is impossible for the head to enter the pelvis. The apparatus required would limit this method of investigation to hospitals, where it should prove of valuable aid in clinical work. The accompanying illustration of a bony pelvis containing a fœtal skull will illustrate the varying resistance shown by bony tissue of different thicknesses in the pelvis. A combination of pelvimetry and examination with the Röntgen rays may prove most useful. Bouchacourt[10] publishes some excellent radiographs of rhachitic pelves. In making these examinations the pelvimeter was first applied, and then radiographs taken, showing the deformity of the pelvis and the pelvimeter in application. In this way the degree of pelvic deformity could be well appreciated.

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[10] L'Obstétrique, January 15, 1900.

SECTION II.

FŒTAL DEVELOPMENT.

CHAPTER V.

THE ORIGIN AND GROWTH OF THE OVUM AND THE DEVELOPMENT OF THE GERM.

While a complete account of the histogenesis of the ovary, the origin and development of the ovum, the transmission of parental characters and variations, the origin of sex, and the growth and development of the embryo must be obtained from biology and embryology, still the obstetrician should have a general knowledge of the subject sufficient to impress him with the important influence of the conditions of early pregnancy upon the germ, as well as to enable him to determine the period of development of the embryo and the fœtus when prematurely expelled, and also to understand the method of production of the most common of the abnormalities in fœtal life with which he may have to deal.

The development of the human fœtus results from the same laws which govern the reproduction of mammalian animals by the means of the union of living cells.

THE OVUM.

The female element, the egg or ovum, is but a highly specialized cell, derived from an organ of epithelial origin. In order that we may clearly understand the development of the ovum, let us briefly trace the histogenesis of the ovary.

In the mammalian embryo two ridges of embryonic tissue (mesenchyma) arise on the dorsal side of the body-cavity, one on each side of the median line. These ridges, known as "genital ridges," are covered by a layer of peritoneal epithelium (mesothelium), which, becoming specialized coincidently with the development of the ridges, is designated as "germinal epithelium." The genital ridge, gradually enlarging as it pushes out into the body-cavity, depends from a relatively narrow base, which becomes the suspensory membrane (mesovarium).

Of the proliferating cells composing the germinal epithelium, there are two kinds: one kind small and abundant, the other variety larger and less abundant (ovic cells). The development of these ovic cells is accompanied by a prolferation of smaller cells which surround them, and by means of which they are crowded back into the stroma of the genital ridge. These ingrowths, known as Pflüger's tubes or ovarian sexual cords, penetrate in all directions the peripheral zone of the vascular stroma forming the genital ridges, and thus give rise to the characteristic adult ovarian tissue. (A vascular connective tissue forming the central mass or medulla of the organ, which passes without any sharp line of demarcation into the cortical portion, where the connective tissue surrounds and separates cords of small epithelial cells, imbedded in which are larger cells, the primitive ova or ovic cells. At the periphery the stroma becomes condensed into a distinct layer, the so-called *tunica albuginea,* which forms a base for the outer investment, a modified peritoneal epithelium, the ovarian mesothelium or germinal epithelium.)

The primitive ova, primordial ova, or ovic cells are found imbedded in large numbers in cords of germinal epithelium, referred to as Pflüger's tubes, which penetrate the outer third or cortex of the ovarian mass, but never extend into the medulla. Of these primitive ova there are estimated to be some 36,000 in each mature ovary. Many of them undergo degeneration; while a small number, continuing in their growth, become completely enveloped in a layer of epithelial cells and thus separated from each other. These epithelial envelopes and their immature ova constitute the so-called primary follicles. The primary follicles sooner or later begin a course of development characterized by increase in size and number of the cells constituting the envelope. The thickening wall consists at first of a single layer of cells, but after a time several layers of cells are developed, and these become divided by a fissure into an inner and an outer layer, the inner layer adhering to the ovum. The fissure generally enlarges and becomes filled with a fluid known as the *liquor folliculi.* With the formation of this fissure and the secretion of its serous fluid the primary follicle becomes a Graafian follicle.

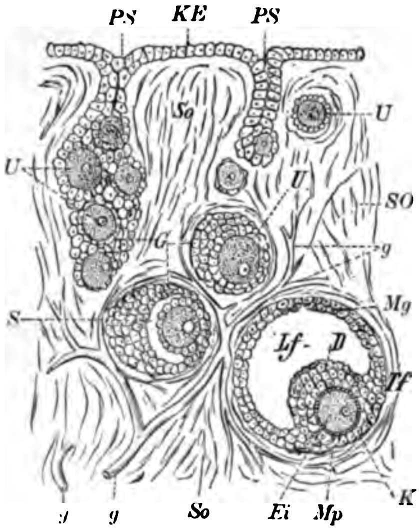
The ovum covered with the inner layer of its original envelope attaches itself to that side of the Graafian follicle nearest the centre of the ovary, forming a mass of cells referred to as the *discus proligerus.*

Coincidently with these changes there has been formed a delicate membrane immediately about the ovum, known as the *zona radiata* or *zona pellucida;* while to the wall of the follicle (the *membrana granulosa*) there has been added a very delicate basement-membrane, the *membrana propria* of Waldeyer. Later on the cells of the *discus proligerus* become radiately arranged about the zone, and constitute the *corona radiata.*

The Graafian Follicle.—The Graafian follicle grows much more than the ovum, and becomes cystic, owing to the accumulation of the *liquor folliculi.*

The cells of the vascular ovarian stroma become modified into two distinct vascular layers immediately about the Graafian follicle. These layers may be distinguished about a mature follicle as an inner *tunica propria,* carrying the smaller bloodvessels, and an outer *tunica* *fibrosa,* carrying the coarser vessels. The vascular supply of the Graafian follicle has a most peculiar arrangement: the smaller vessels ascending from the base of the follicle become much subdivided, and form a minute network as they pass toward the summit, where they converge toward a spot on the surface of the ovary, leaving a non-vascular spot, the stigma, the point at which the Graafian follicle is destined to rupture upon reaching maturity.

FIG. 22.



Development of Graafian follicle. (WIEDERSHEIM.)

KE. Germinal epithelium, from which Pflüger's tubes, **PS,** in ovarian stroma are developed. **So.** Ovarian stroma. **gg.** Small vessels. **UU.** Primitive ova. **S.** Space between membrana granulosa and ova. **Lf.** Liquor folliculi. **D.** Discus proligerus. **Ei.** Ripe ovum, with germ-vesicle and germinal spot (**K**). **Mp.** Membrana pellucida. **Tf.** Muscular sheath of follicle. **Mg** Membrana granulosa.

The Mature Ovum.—As the egg becomes mature it is separated from the zona by a fissure or space (the perivitelline space); it has an axis, and at its extremity two poles; near one of these a nucleus develops, while at the opposite pole the yolk-material accumulates in a considerable mass. In a fresh specimen the egg floating freely in the zona will present the nuclear or lighter pole uppermost. The process of ripening in the egg concerns the nucleus most of all; prior to this the nucleus is large, having a well-developed membrane and reticulum; but as ripening proceeds it begins to shrink, the membrane becomes wrinkled, and the surface presents an irregular appearance. Nuclear fluid passes through the membrane into the substance of the ovum, and the small portion of reticulum remaining becomes a slender thread, called by Marshall the "nuclear skein." All that finally remains of the nucleus is this minute skein; this now moves to the surface of the egg; it gradually becomes a spindle in shape and divides into two equal parts, one of which is forced out of the egg as the first polar body; the other half subsequently divides again into a second polar body, also extruded from the egg, and into a portion which remains in the egg and is known as the "female pronucleus."

When this process is complete the ovum is said to be matnre and capable of impregnation. The function and final disposition of the polar globules or polar bodies are entirely unknown. Impregnation is effected by the union of the male cell with the female pronucleus, and from this union proceeds the development of the embryo by the process of cell-division or segmentation.

The Discharge of the Ovum.—The ripe ovum is discharged from the ovisac or Graafian follicle, which rises to the surface of the ovary and ruptures at the non-vascular spot referred to as the stigma; the ruptured follicle remaining at the periphery of the ovary is called the *"corpus luteum;"* this differs in appearance, depending upon the presence or absence of impregnation. The name *"corpus luteum"* is applied to the ruptured follicle because of the yellowish color assumed by this body as the follicle and its contents undergo fatty degeneration and absorption. The difference in appearance between the *"corpus luteum"* of menstruation which remains after the discharge of an ovum which is not impregnated and the *"corpus luteum"* which follows the discharge of an ovum subsequently impregnated is given as follows by Minot and Dalton:

The Corpus Luteum.—"The corpus luteum of menstruation begins with a blood-clot. The more recent the date of the menstrual flow the fresher is the clot in the cavity of a ruptured Graafian follicle and the less change has taken place in its surrounding wall. A few days later the wall begins to be enlarged and thickened, and this enlargement within a confined space causes it to become folded upon itself in short, zigzag reduplications, mainly at the deeper part of the follicle. As the process goes on, the entire wall participates in the hypertrophy. Its convolutions are extended and multiplied, often in a very complicated manner. They project into the cavity of the follicle, encroach on the central clot, and become pressed against each other, forming by their coalescence a thickened, granular-looking envelope. Previously to the rupture of the Graafian follicle its wall is a uniformly smooth, vascular membrane, not more than one-fourth of a millimetre in thickness. After the rupture its thickness increases to one-half a millimetre, but as the foldings above described grow in number and in depth, and crowd against each other laterally, the apparent thickness of the envelope thus formed becomes much greater, and may reach three or even four millimetres, especially at the deepest part of the follicle. In this way there is produced, during the intermenstrual period, a corpus luteum, occupying the substance of the ovary immediately beneath the superficial cicatrix which marks the site of the ruptured follicle. At this time the central clot is red and gelatinous, while the convoluted wall is of a light rosy hue, mixed with more or less of a yellowish tint. Subsequently the whole structure diminishes in size, and the convoluted wall assumes a more decided yellow."

Leopold distinguishes between the *typical* and *atypical* corpora, the former being those that start at the menstrual epoch and have a blood-clot, a result probably of the ovarian hyperæmia; the latter beginning intermenstrually and having little or no blood. He says: "The typical corpus luteum appears on the first day as a freshly ruptured follicle which has filled itself with blood; on the third day as an immense blood-cavity; about the eighth day a thin cortex and a clearer nucleus are marked in the clot. From the twelfth day on the cortex thickens and becomes folded; by the sixteenth day it becomes pale red or yellowish. Toward the twentieth day the nucleus shrinks markedly; the cortical band becomes more and more yellow and shoots in toward the centre in rays and narrow folds, so as to leave, by the twenty-fourth day to the thirty-fifth day, only a small, pale nucleus enclosed in a much-convuluted bright yellow shell."

Dalton further observes on this subject: "The corpus luteum of pregnancy begins in a similar manner to that of menstruation, but its growth continues. At the end of the first month its wall is convoluted, much thickened, and of a brilliant yellow color; the central clot is nearly or quite decolorized, and constitutes a white or whitish, firm, central mass, which in nearly one case out of three has a central cavity with well-defined, smooth walls. Sometimes a few bloodvessels penetrate through the lutein layer. The external convoluted wall continues to grow by encroaching upon the clot or white nucleus *(corpus albicans)*, and at the same time the brilliancy of the yellow color diminishes. At term the white nucleus takes up about one-third of the diameter of the corpus and is still distinctly connected with the stigma, so that the lutein wall is interrupted at one point; the corpus, as a whole, is somewhat smaller than at from two to six months. After delivery resorption goes on rapidly.

"The brilliant yellow color is especially characteristic of man; in sheep the pigment is pale brown; in the cow, dark orange; in the mouse, brick-red; in the rabbit and pig- flesh-colored."

Lutein.—Lutein is a crystalline body and one of a series of animal pigments known as lipochromes, which are found abundantly in the blood and viscera of animals and in the yolks of eggs. They are characterized in spectroscopic analysis by presenting absorption-bands toward the violet end of the spectrum. Lutein occurs in minute, rhombic prisms or plates, which present different colors when viewed in the direction of different axes. These crystals are soluble in alcohol, ether, chloroform, and benzol, insoluble in water and more or less rapidly bleached by the action of light.

Variations in the Development of the Ovum.—The tendency of the germ-cell to reproduce along primitive lines would appear to be so strong that for a long time it resists the gradually changing conditions in the species; but finally these conditions prove too much in some one case, and an offspring appears that varies greatly from its species, and which in its own organization combines conditions similar to those which have been applied in varying degrees to previous embryos of its race, but which they have resisted sufficiently to escape being considered variations. It is not yet proved that variations are predetermined in the ovum, but, so far as experience goes, they are the result of chemical and metabolical conditions within and without the embryo.

The question of sex comes under the head of variations, since the female state must be regarded as a variation from a more primitive or male state. This view is supported by evidence to which we have already referred, to the effect that sex is determined late in the history of embryonic development, and depends to a great degree upon the trophic conditions of the mother.

Variations are not to be attributed to inheritance, but to disturbances of the developmental process; and the degree of the variation from the normal type may be so slight as to escape observation, or so great as to constitute a monster with every gradation of variation between the two extremes.

The later the stage of development disturbed the slighter the variation; whereas, karyokinetical disturbances of the earlier stages of development may give rise to monsters or twins.

The experiments of Loeb and Dreisch demonstrate the fact that several perfect embryos may be derived from the same ovum. Where multiple offspring arise from the same ovum they constitute "true" twins, and are of the same sex.

Determination of Sex.—It is beside our purpose to discuss at length the factors entering into the determination of sex. Those desiring to get at the basis upon which our brief generalizations are founded are referred to the works of Dusing,[11] Heyer,[12] Semper,[13] Geddes,[14] Thompson,[15] Weismann,[16] Wilekens,[17] Yung,[18] and

[11] Düsing. C.: Die Regulierung des Geschlechtsverhältnisses bei der Vermehrung der Menschen, Thiere, und Pflanzen. Jena, 1884; or, Jen. Zeitsch. f. Naturw.. xvii. 1883. Also. Die experimentelle Prüfung der Theorie von der Regulierung des Geschlechtsverhältnisses. Jen. Zeitschr. f. Naturwiss., xiv., Supplement. 1885.

[12] Heyer. F.: Untersuchungen über das Verhältniss des Geschlechtes bei einhäusigen und zweihäusigen Pflanzen, unter Berücksichtigung des Geschlechtsverhältnisses bei den Thieren und den Menschen. Ber. landwirthschaft. Inst. Halle, 1884. v. pp. 1-152.

[13] Semper, Carl: The Natural Conditions of Existence as they Affect Animal Life. Internat. Science Series. London, 1881.

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Ryder.[19] The factors generally considered are: *(a)* Time of fertilization; *(b)* conditions of nutrition, age, etc., of the parents; *(c)* condition of the reproductive elements; *(d)* environment of the embryo.

(a) The longer the time between the liberation and fertilization of the ovum the greater the tendency to the development of a male.

(b) The age of the parents seems to be of secondary importance, statistics failing to confirm Hofacker's[20] and Sadler's[21] law that "when the male parent is the older the offspring are preponderatingly male, while if the parents be of the same age, *a fortiori,* if the male parent be the younger female offspring appear in increasing majority.

(c) The condition of the reproductive elements, depending upon the constitution and habits of the parents, has undoubtedly much to do toward determining sex. The tendency is toward the sex of the better nourished parent. In seasons of adversity—famine, war, epidemics, poor harvests, or high prices—when the females are more poorly nourished than usual, male births predominate. Females with small placentæ are said to bear more boys.

The generalization may, therefore, be made that all conditions which tend to the vigorous and well-nourished condition of the ovum and of the mother after impregnation tend to the production of female offspring. On the other hand, all conditions which tend to a loss of vitality in the ovum, such as delayed fertilization or trophic impairment of the mother before and after impregnation, tend to determine the sex of the offspring as male.

Entrophic Conditions.—*i. e.,* perfect nutrition and assimilation with anabolic or growth-tendencies in the mother—determine predominant femaleness in the progeny.

Katabolic tendencies, depending upon deficient nutrition (trophesy, physiological disintegration), determine predominant maleness in the progeny.

The period of development at which sex is determined is very early in the human embryo, there being really no period of prolonged sexual neutrality or embryonic hermaphroditism, notwithstanding the apparent delay in the determination or development of the genital organs corresponding to the sex.

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CHAPTER VI.

THE DEVELOPMENT OF THE EMBRYO AND FŒTUS.

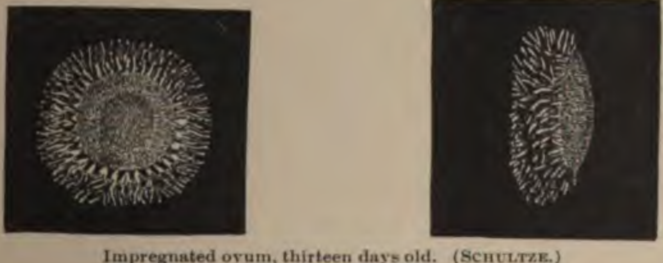
RETURNING to the consideration of the growth of the embryo, we find its further development to be in accord with the laws of evolution and the phenomena observed by biologists in studying the same processes in other than the human species.

Segmentation.—As discharged from the ovary, the ovum is surrounded by the *corona radiata,* which disappears upon impregnation. Segmentation is thought to begin with the passage of the ovum through the oviduct. The ovum separates in various planes, which have been followed up to twelve segments. Succeeding cleavages increase the segments or cells many-fold. The cells of the ovum, sometimes termed during segmentation "segmentation-spheres," have no membrane; the nucleus is large, clear, and vesicular, while the yolk-granules are small, highly refractile, and nearly spherical.

Passing through the oviduct into the uterus, the ovum dilates into the blastodermic vesicle, the cells of the outer layer multiply and flatten, thinning and expanding the *zona pellucida.*

Ectoderm, Endoderm, and Mesoderm.—The internal aggregation of cells is attached to some point on the circumference of the vesicle. This leaves a cavity between two layers called the "segmentation-cavity," or cavity of the blastoderm. As the blastoderm vesicle continues to expand, it produces, in some animals, a corresponding increase in the size of the uterus. The vesicle contains fluid secreted by the layers in the wall of the vesicle, which in turn derive the fluid from an abundant secretion from the glands in the uterus. This uterine secretion is undoubtedly nutritious in character. The inner comparatively thick mass of cells becomes gradually differentiated into two layers, superior and inferior, external and internal, the "ectoderm" and "endoderm." Minot was the first to establish the general principle that in all animals the ovum undergoes a total

FIG. 23. FIG. 24.



Impregnated ovum, thirteen days old. (SCHULTZE.)

[illegible] divide faster and [illegible]. These layers grow [illegible] forming two layers or [illegible] the primitive [illegible] the primitive [illegible] other cells of the [illegible] layers of cells [illegible] the "morula." [illegible] primitive trace or [illegible] layers of cells [illegible]. These layers [illegible] blast, hypo- [illegible] endoderm, [illegible]

Development of Organs.—[illegible] organs of [illegible] classification [illegible]. Upon this [illegible] may be taken as [illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible] digestive tract
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible] lungs

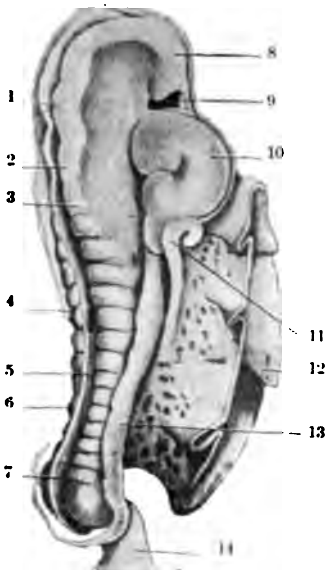
[illegible] it is seen that [illegible] the other. [illegible] viscera, while [illegible] thorax. The [illegible] layers of cells [illegible] effected by various formations, by the projection of cell-[illegible] infolding of epithelium.

Development of the Trunk.—The central portion or trunk of the embryo is developed at the primitive trace by the medullary plate, a portion of the upper layer or ectoderm, which is of considerable thickness. The edges of this plate gradually turn upward, forming a groove whose sides rise higher and higher, finally arch toward each other, and meet to form a tube. This tube encloses the medullary canal, in which are finally developed the brain and spinal cord.

The notochord is a peculiar embryonic structure, which is the primitive axis-skeleton of vertebrates. About the second month of fœtal life it begins to be resorbed and to be replaced by the vertebræ proper.

The Organs of Circulation and the Blood.—One of the most interesting phenomena occurring in the development of the embryo is the formation of the organs of circulation and of the blood. The first circulation of nutrient material is effected by transudation, or osmosis, of fluid from the oviduct into the yolk-substance of the ovum. A similar phenomenon occurs during the early life of the embryo after it has become imbedded in the deciduous membranes. The first traces of a heart are found in the cervical region, the heart developing and beginning to beat before the bloodvessels are formed and connected with it. The first circulating fluid found in the heart is clear and without cells. At about the same period the bloodvessels and blood-cells are developed in the vascular area of the yolk-substance outside the embryo proper. The first bloodvessels are channels excavated, as it were, in the yolk-area, which gradually push their way toward the heart and become connected with it. The first blood-cells are also

FIG. 25.

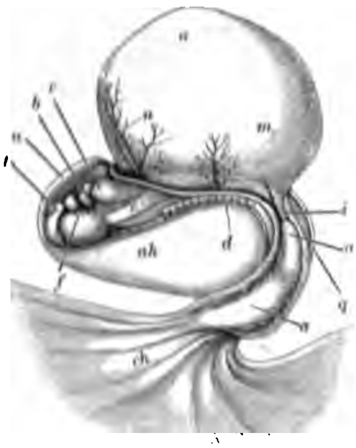


Embryo of thirteen to fourteen days. (SCHULTZE.)

1. Mid-brain. 2. After-brain. 3. Cerebellum. 4. Amnion. 5 and 7. Neural canal. 6. Primitive Trace. 8. Fore-brain. 9. Oral cavity. 10. Heart. 11. Vitelline canal. 12. Vitelline membrane. 13. Border of medullary plate. 14. Allantois.

formed in the same area where the vessels are developed, and come through the vessels to the heart. The first blood-cells are red and nucleated; they persist in this condition only during fœtal life, being gradually substituted by the non-nucleated red blood-corpuscles. The first bloodvessels are tubes of protoplasm with isolated nuclei: these vessels gradually become veins and arteries; in the former instance by dilating, and in the latter by increasing the thickness of the vessel-wall. Both bloodvessels develop by the multiplication of cells within the walls. The nucleated red blood-cells are the only corpuscles found at the end of the first month in the embryo's life. They gradually disappear, until, at the end of the third month, they are almost entirely absent. Among the many theories regarding the origin of the red blood-corpuscles, that of Schäfer may be quoted, who believes that they originate from the protoplasm of the cells which form the bloodvessels.

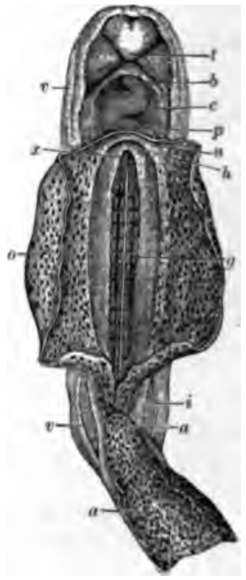
Fig. 26.



Embryo with vitelline membrane, amnion, and allantois Fifteen days. (Coste.)

a. Abdominal stalk (allantois) with vessels of chorion (*ch*). *b*. Aorta. *c*. Heart. *d*. Border of abdominal opening. *e*. Œsophagus. *f*. Primitive arches. *i*. Intestine. *m* Omphalo-mesenteric artery. *n*. Omphalo-mesenteric vein. *o*. Vitelline membrane. *u*. Urachus. *v*. Amnion. *ah*. Cavity of amnion.

Fig. 27.

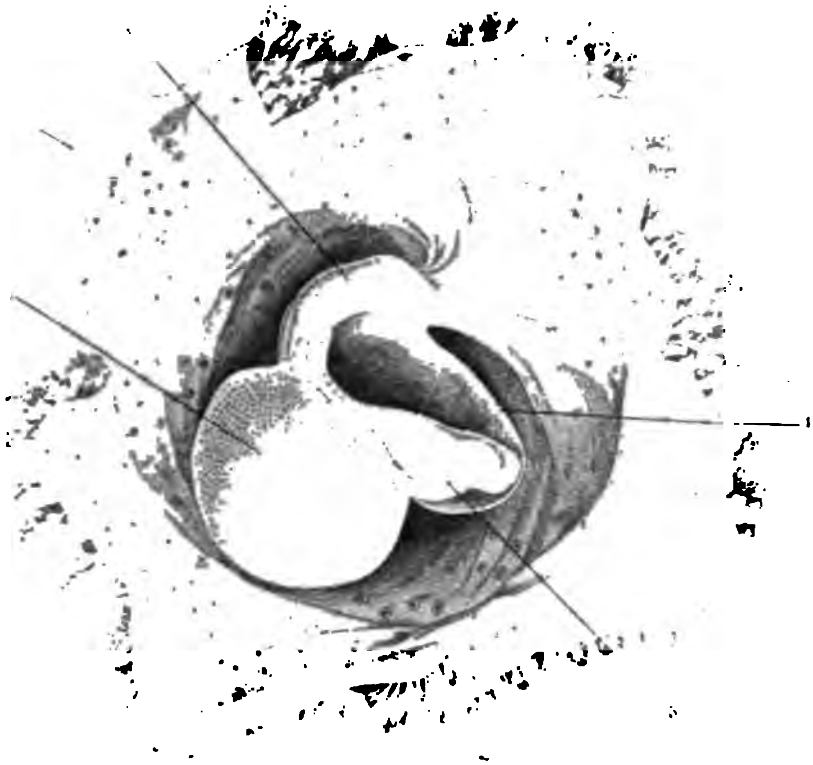


Same embryo magnified. Vitelline membrane removed.

a. Abdominal stalk (allantois). *b*. Aorta. *c*. Heart. *g*. Aorta. *h*, *n*. Umbilical and omphalo-mesenteric vessels emptying into heart. *i*. bowel. *o*. Umbilical vesicle. *p*. Pericardium. *t*. anterior cranium. *u*. Ureters. *v*. Amnion. *x*. Bowel.

The Heart and Wolffian Body.—The first form of the heart is that of a simple tube, one end of which joins the arterial system of the embryo, while the other connects with the venous system of the yolk-substance. Next in interest and importance to the primitive heart and its vessels may be considered the primitive kidney, often termed the Wolffian body: this is a series of tubules arising from a primitive ridge, called the Wolffian or nephridial ridge, located in the embryo just outside the genital ridge before referred to. From the tubules of the Wolffian body are gradually developed the kidney and also the ducts of Müller, from which are finally developed the female genital organs. As we have already seen, the primitive epithelia from which are developed the germinal elements of both sexes have their origin in the genital fold or ridge of cells appearing near the Wolffian body. In this area may be found the beginnings of ova and also the nuclei or granules from which are ultimately developed the spermatozoa.

FIG. 28.



Embryo with opened membranes. Fifteen to eighteen days. (COSTE.)

1. Allantois. 2. Parietal mesoblast. 3. Vitelline membrane, yolk. 4. Amnion. 5. Heart.

The Allantois. – As development proceeds, the two ends of the embryo separate more and more widely from the yolk-substance. As the embryo is yet without an independent circulation, and is still dependent upon the yolk for nutriment, it maintains its connection with this base of supplies through a vesicle or bladder-like body known as the allantois. From the allantois, whose early development is unknown, there gradually develop the two membranes which surround the fœtus, the amnion and the chorion.

segmentation, during which the cells of the ectoderm divide faster and become smaller than the cells of the endoderm. These layers grow by what is styled "concrescence," gradually forming two layers or plates, which unite in the axial line about the canal of the primitive trace or notochord. The cells immediately surrounding the primitive trace are often lighter in color and clearer than the other cells of the ovum. As segmentation becomes complete, and the two layers of cells described begin to form, the ovum is sometimes styled the "morula," because of its resemblance to a mulberry. The primitive trace or axis is well studied by transverse sections, which show layers of cells from which develop the various portions of the body. These layers may be broadly grouped in three, formerly known as epiblast, hypoblast, and mesoblast, and termed by later writers ectoderm, endoderm, and mesoderm.

Development of Organs.—In classifying the various organs of the body which develop from these layers, the basis of classification must be the essential element in the organ in question. Upon this basis the following classification, tabulated by Minot, may be taken as a comprehensive and rational one:

Ectodermal.	*Mesodermal.*	*Endodermal.*
Skin (epidermis).	1. Mesothelium.	Epithelium (digestive tract).
Epidermal structures:	Peritoneum.	Thyroid.
Hairs.	Pleuræ.	Tonsils.
Glands:	Urogenital.	Trachea and lungs.
Sebaceous.	Wolffian body.	Œsophagus.
Sudorific.	Kidney.	Stomach.
Salivary.	Testes.	Liver.
Mammary.	Ovary.	Pancreas.
Corneal epithelium.	Oviduct.	Intestine.
Lens of eye.	Uterus.	Yolk-sack.
Central nervous system:	Vagina, etc.	Cæcum.
Ganglia.	Striated muscle.	Vermix.
Nerves.	2. Mesenchyma.	Colon.
Eye:	Connective tissues.	Rectum.
Optic vesicle.	Blood.	Allantois (bladder).
Optic nerve.	Bloodvessels.	Notochord.
Olfactory organ.	Lymphatics.	
Auditory organ.	Spleen.	
Mouth-cavity:	Smooth muscle.	
Teeth.	Fat-cells.	
Hypophysis.	Marrow.	
Anus.	Skeleton.	
Chorion:		
Placenta.		
Amnion.		

When the epithelial layers of the body are considered, it is seen that the organism consists of two epithelial tubes, one within the other. The branches of the inner tube form many of the viscera, while between the tubes are the cavities of the abdomen and thorax. The development of the various organs of the body from the layers of cells described is effected by various formations, by the projection of cell-masses, or by infolding of epithelium.

Development of the Trunk.—The central portion or trunk of the embryo is developed at the primitive trace by the medullary plate, a portion of the upper layer or ectoderm, which is of considerable thickness. The edges of this plate gradually turn upward, forming a groove whose sides rise higher and higher, finally arch toward each other, and meet to form a tube. This tube encloses the medullary canal, in which are finally developed the brain and spinal cord.

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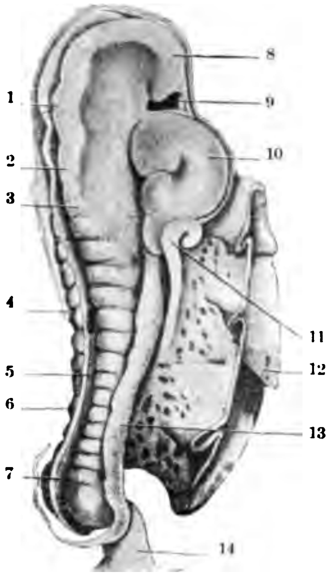

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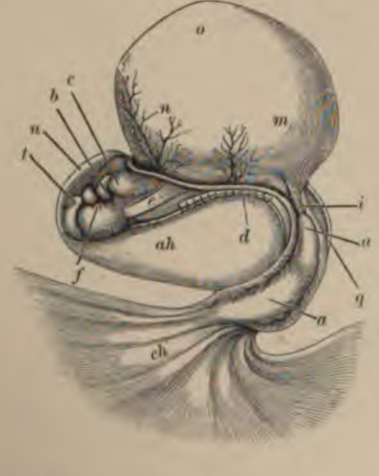

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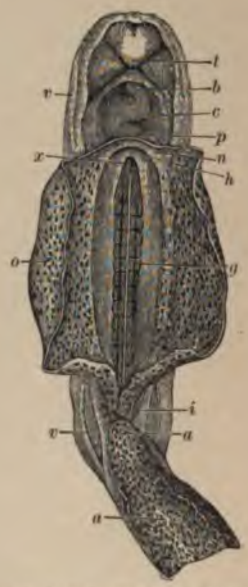

Same embryo magnified. Vitelline membrane removed.

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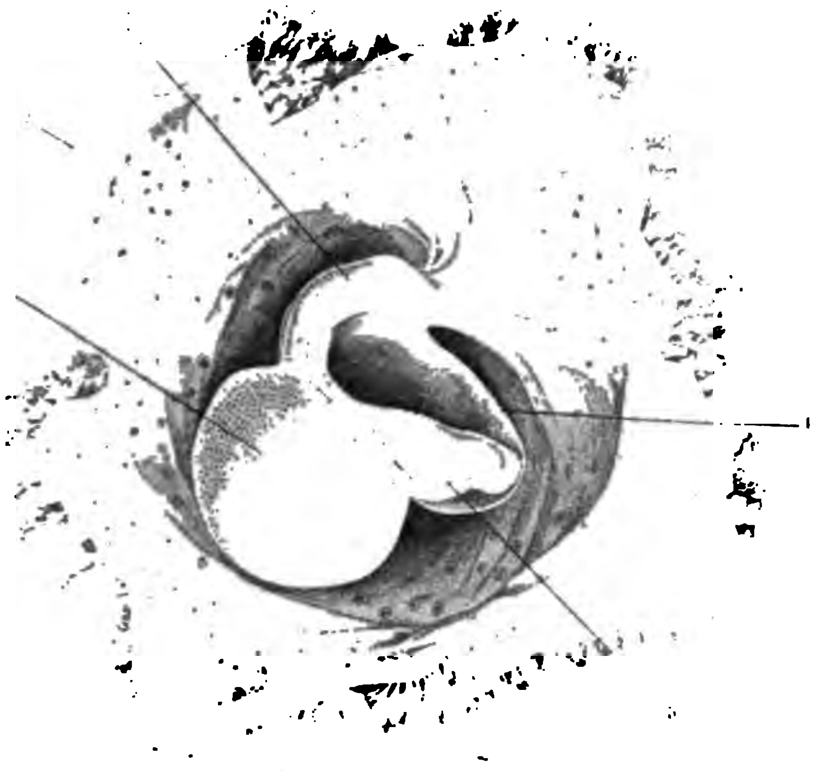

Embryo with opened membranes. Fifteen to eighteen days. (Coste.)

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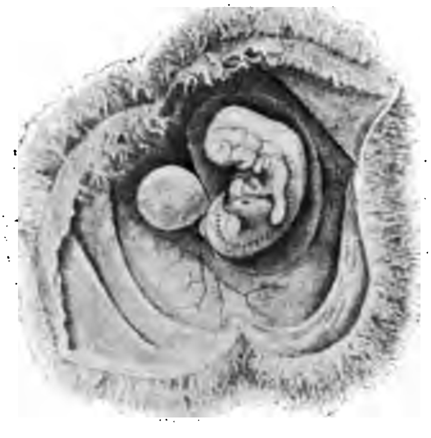
The Allantois. As development proceeds, the two ends of the embryo separate more and more widely from the yolk substance. As the embryo is yet without an independent circulation, and is still dependent upon the yolk for nutriment, it maintains its connection with this base of supplies through a vesicle or bladder like body known as the allantois. From the allantois, whose early development is not known, there gradually develop the two membranes which surround the fœtus, the amnion and the chorion.

The Bloodvessels.—The great bloodvessels of the embryo, the beginnings of the respiratory tract, and of the important cervical nerves are provided for in the branchial arches, which resemble the gill-arches in other forms of life. From these are gradually developed the aortic arch and other important structures. Side by side with the development of bloodvessels in the embryo itself occurs the growth of capillaries in the "area vasculosa," these vessels gradually widening in their network and communicating with the venous end of the embryonal heart. In the earliest human embryos examined the vesicle or yolk has been found with a complete development of bloodvessels.

The Amnion and Chorion.—The early development of the amnion, the fœtal membrane which remains always next to the fœtus, is unknown. In the earliest specimens examined this membrane has been found a closed sac about the embryo, and hence no clear idea has been gained of its methods of formation. It apparently rises at the sides of the embryo from the allantois and the edge of the yolk-sac. The chorion, the membrane which always remains next to the uterus or furthest from the embryo, is formed by an outer layer of the ectoderm with an inner layer of mesoderm. It completely surrounds the ovum in the early stages of its development. An interesting idea of the early appearance of the embryo is obtained from the earliest specimen which has been carefully studied, that of Reichert. There is good reason for believing that this was not more than thirteen days old. It was a flattened sphere 3 3-10 by 5 5-10 millimetres. At its two poles or extremities it was smooth, but having a fringe of tuft-like processes (villi) separating the smooth areas around the poles. On opening the embryo a mass of cells was found next to that portion which had been nearest the uterus, and also a mesh or network of threads without nuclei.

FIG. 29.

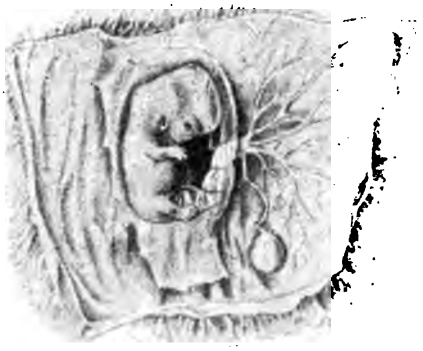


Embryo of four weeks, showing vitelline membrane and chorion. Showing the development of the limbs, heart, and liver. (SCHULTZE.)

The Villi.—The villi gradually spread and became branched, and at about the twelfth or fourteenth day the ovum is enclosed in the decidua, the tips of the villi alone touching the uterine decidua, and thus enabling nourishment to pass through the cells of the decidua into the villi of the ovum. The human ovum is remarkable for the very early appearance and development of its chorion with the chorional villi. As the amnion develops, the space between it and the embryo becomes filled with fluid, known as the amniotic liquid.

The Chorionic Vesicle and First Circulation.—At the time when the chorion is first fully developed, the contents of the chorionic vesicle—that is, the embryo surrounded by the chorion—are, first, the embryo, the stalk of the allantois, and the yolk-sac, and also the chorionic fluid. Concerning this but little is known. It is probably analogous to the amniotic fluid, which later plays an important part in the economy of the ovum. The entire chorion is vascular at first, the allantois conveying blood to it from the embryo by means of two arteries, and returning the same with two veins. In this manner the embryo has a circulation before the placenta is formed, or what is known as the fœtal circulation becomes established. The first chorion is entirely covered by villi, which are club-shaped, irregularly formed bodies, subdivided in branches. As has been stated, they do not perforate the blood-sinuses of the deciduous membrane, but are attached by their tips to the surface of the uterine lining. It is believed that they do not, however, enter the glands of the uterus. These villi are at first solid outgrowths of cells from the ectoderm and mesoderm, becoming gradually hollowed out by the formation of bloodvessels. As the ovum grows the villi gradually divide themselves into those which continue to increase luxuriantly, the "chorion frondosum," and that portion of the chorion which gradually aborts or atrophies, known as the "chorion læve." The reason for the persistence of a portion of the villi and for the disappearance of the rest is found in the fact that out of a portion of the chorion with its villi is

FIG. 30.



Embryo of eight weeks, showing umbilical vesicle and cord. (KÖLLIKER.)

formed the placenta, and as all the villi are not needed for this development, the remainder atrophy. In the "chorion frondosum" the bloodvessels develop with great luxuriance. The chorionic fluid may be coagulated by hardening agents, which form a network of threads; this is all that is apparently known regarding its composition.

The Amnion.—While the chorion is essentially a very vascular membrane, and is developed for the sake of its bloodvessels, the amnion, on the contrary, is entirely without nerves and bloodvessels, and is composed of several layers of epithelium, forming a thin, transparent membrane. The growth of the amnion begins rapidly during the fourth week, and at the second month there is already considerable amniotic fluid. It derives its cells from the mesoderm and ectoderm, and these epithelia are remarkable for processes extending from one cell to another. Between the cells are spaces of considerable size, making the whole membrane spongy in its meshwork.

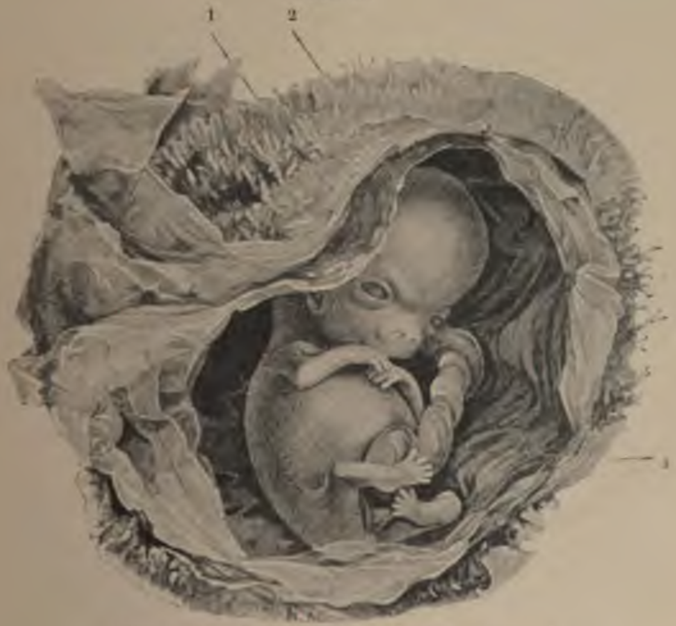
The Amniotic Liquid.—Both the fœtal membranes, amnion and chorion, although separated at first during the first two months of gestation, gradually join during the third month. The union between them, however, is always slight, and the two can be readily separated, as is seen in any recent specimen of placenta and membranes. A very important portion or adjunct of the amnion is the amniotic fluid, whose function it is to protect the embryo from mechanical injury, to maintain its temperature, and enable the growing fœtus to move. During labor it moistens the birth-canal of the mother and also the child, although it is not essential to birth, as seen in cases where the fœtus is expelled in its unbroken membranes. Minot justly urges that the amniotic liquid furnishes the embryo with water, and that the fluid itself is formed by transudation from the uterus or from the chorion through the amnion. There is abundant proof that the fœtus swallows the amniotic liquid, and as the amniotic liquid contains but little solids, its value must be chiefly for the water of which it is composed. The amount varies greatly. The composition of the *liquor amnii* is that of a serous fluid. Its specific gravity varies from 1.0005 to 1.0082. Its percentage of salts is between 1 and 2. Vogt and Scherer have tabulated its composition as follows:

	3 months.	4 months.	5 months.	6 months.	10 months.
Water	983.47	979.45	975.84	990.29	991.74
Albumin and mucin	. . .	10.77	7.67	6.67	0.82
Extracts	7.28	3.69	7.24	0.34	0.60
Salts	9.25	6.09	9.25	2.70	7.06

It may be observed from this table that albumin diminishes largely toward the end of gestation, as does also the percentage of salts. Gusserow has shown the absence of fibrin-forming substances in the amniotic liquid. Fehling has ascertained that the percentage of urea is very small, at the tenth month being 0.045 per cent. The facts that the amniotic liquid in composition is a serous fluid, and that it appears before the embryo has excretory organs, are against the supposition that the amniotic liquid is excreted by the fœtus. Experiment has shown that a substance injected into the jugular vein of a pregnant animal colors the amniotic liquid, while no evidence of this substance is found in the fœtus. It seems most probable that the amniotic fluid comes in large part through the amnion from the chorion and from the uterus. It is possible that a small portion may be derived from the fœtus, but this portion must be very inconsiderable.

The Yolk-Sac.—The nutrient protoplasm which supports the embryo is contained in the yolk-sac, a pear-shaped vesicle connecting with the extremity of the intestinal canal of the embryo. This vesicle or sac is of the greatest size and importance from the third to the fourth week of embryonal life, when it is nearly as large as the embryo itself, its hollow lined with the cells of the endoderm and mesoderm, and abundantly supplied with bloodvessels.

FIG. 31.

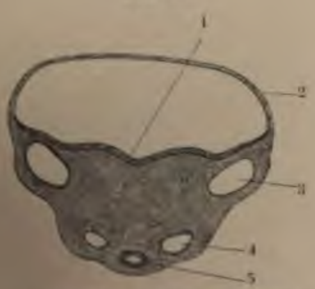


Embryo at beginning of third month. (SCHULTZE.)
1. Chorion. 2. Amnion. 3. Umbilical cord.

The Development of the Umbilical Cord.—In the human subject the first trace of the umbilical cord is found in the stalk of the allantois. The allantois is never a separate vesicle from the embryo, but is instead a cylindrical offshoot or diverticulum. The amniotic membrane has its origin from the sides of the umbilical cord, there being no free allantois, but that vesicle and stalk being a direct communication between the embryo and chorion. As the cord develops, it can be seen that it is never covered by the amnion.

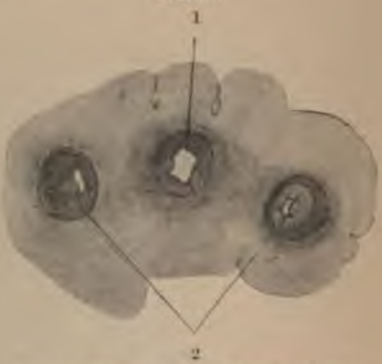
The development of the umbilical cord may best be observed in the stalk of the allantois. On cross-sections of the cord its connective tissue is seen in branching cells from the ectoderm and mesoderm, while its bloodvessels enlarge their cells, becoming thick and muscular. At term the cord is whitish in color, twisted in spirals, and varying greatly in length. At the fœtal end, which is narrower than the rest of the cord, the epidermis of the fœtus extends for a short distance upon the cord. At the placenta the chorion and the cord join. Although the cord usually terminates just outside the centre of the placenta, it may join the chorion entirely without the placenta, forming a membranous insertion or velamentous insertion of the cord. The vessels of the cord must be considered as arranged in spirals, and not as twisted, there being no possible explanation for the twisting of the cord. Its external surface contains epithelium continuous with that of the amnion. Its interior comprises Wharton's jelly, which is embryonic connective tissue, two arteries and a vein, and a few remnants from the allantois. Capillaries, lymphatics, and nerves

FIG. 32.



oss-section of allantois. (HIS.)
Medullary portion. 2. Amnion.
Umbilical vein. 4. Umbilical ar-
y. 5. Allantoic vessel.

FIG. 33.

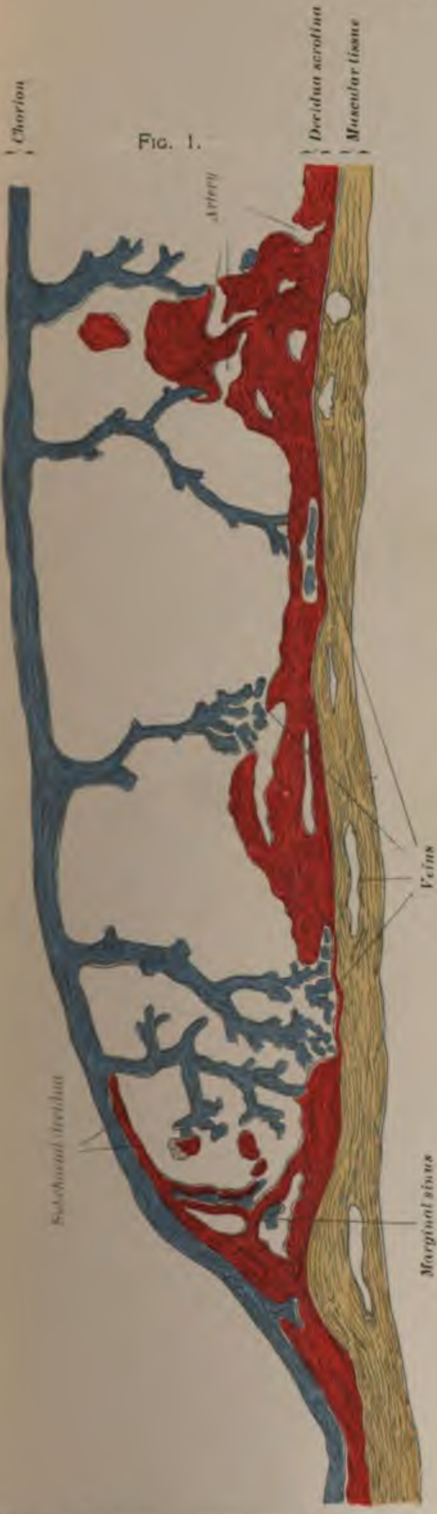


Cross-section of umbilical cord at term. (SCHULTZE.)
1. Umbilical veins. 2. Umbilical artery.

have not been proved to be present. The arteries are peculiar in be-
composed of a muscular tissue and intima without elastic tissue.
ie Placenta.—The placenta is a flesh-like mass of tissue about
inches in diameter, but varying greatly, and proportionate to
ulk of the child. The surface next to the fœtus is covered by the
and is smooth and reddish-gray in color. The surface next
rus resembles somewhat raw beef in color, and divides into
t an inch in diameter, called "cotyledons."
centa grows thin at the edges, passing into the membranes
ttached around the edge of the placenta. On close exami-

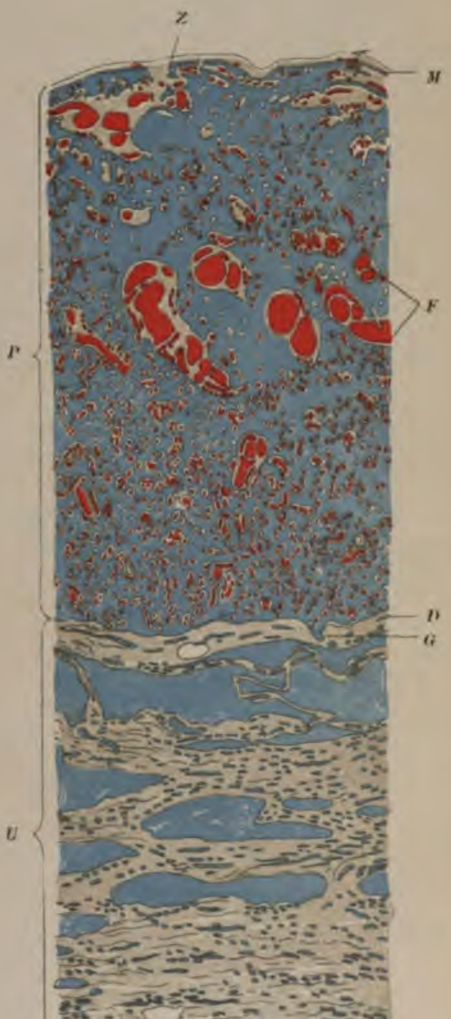
PLATE II.

Fig. 1.



Human Placenta. (Hofmeier and Schultze.)

Fig. 2.



Human Placenta and Uterus Injected. (Schultze.)

F. Fœtal vessels (red). *G.* Maternal vessels (blue). *M.* Chorion. *P.* Placenta. *U.* Uterus. *Z.* Origin of villi of chorion. *D.* Decidua serotina. Preparation by Tafani.

nation the cotyledons of the placenta are interspersed with patches and network of flesh-color or pale yellow. This appearance is caused by the villi which are visible through the chorionic membrane. The bloodvessels which pass through the cord branch at the placenta in every direction, and can be followed upon the surface, the arteries being superficial and the veins deeper, although direct anastomosis on the surface of the placenta has not been observed. Over the uterine surface of the placenta there is found a soft, thin, membranous investment, which is the decidua serotina or placental decidua, and which is split into two parts at the time of the expulsion of the fœtus. Sections of the placenta show great masses of tufts, resembling irregular cylinders, which are found, on closer examination, to be twigs springing in turn from other branches, which can finally be traced to the chorion. The intervillous spaces, filled with blood, form complex channels in the placenta. Arteries and veins of various sizes are imbedded in the vascular cells of the placenta and open spirally into its channels. A placenta, when attached, follows the wall of the womb, its decidual surface being convex, it being thickest at its centre and gradually thinning toward the margin. (Plate II.)

The Placental Circulation.—It is no longer believed that the maternal and fœtal circulations directly connect in the placenta, although the exact way in which nourishment is transmitted from mother to child is not clearly known. It is probable, however, that the spaces between the villi are, from the first development, blood-channels for maternal blood, and that the conditions for the passage of nutritious material are thus favorable, whether it be by transudation or by the transfer of masses of leucocytes. (Plate III.)

As the placenta grows the thickened lining of the uterus degenerates, as if to bring the villi of the placenta into more intimate relation with the blood-channels of the mother. This brings the chorion of the fœtus in relation with the connective tissue of the uterus, whose enlarged capillaries afford nutriment for the vessels of the chorion.

The Syncytium.—Our attention has recently been called to the development of embryonal tissue implicated in the growth of the mother and child, allied to connective tissue, and which is capable of taking upon itself a malignant development in some cases. This tissue is known as the syncytium. Among the many who have written upon its development, Ballantyne[22] gives the following description: "Under the microscope the villi of the full-time placenta are seen to be covered by a layer of protoplasm in which nuclei are embedded at irregular distances from each other; this layer is the syncytium. It is the fœtal epithelial covering. In the placenta of early intrauterine life there is a second layer of large nucleated cells, with distinct walls lying below the syncytium of the villi; this has been called Langhans' layer, and it is also in all probability fœtal in origin. Langhans' layer disappears at an early stage in the life history of the placenta.

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[22] Ballantyne: Antenatal Pathology and Hygeine, Edinburgh, 1902.

The syncytium is at first more active, and from it spring numerous buds of various shapes and sizes, and in which are seen hyaline droplets, which may become separated from it and float free in the maternal blood. Under the epithelium of the villi is a very delicate connective tissue stroma; so delicate is this stroma in the terminal villi that the capillaries lie immediately under the epithelium, their walls consisting of practically a single layer of endothelium, with only a layer of endothelium and one of epithelium between the blood in the fœtal capillaries and that of the mother in the intervillous spaces. During the last three months of pregnancy the vessels of the villi at the margin of the placenta show obliterative changes, with thickening of the intima and of the adventitia of the terminal and medium-sized arterioles, and in them the circulation stops, while the veins and capillaries are unaffected till the changes in the arterioles are completed. In this way the blood supply to certain groups of villi is diminished, and the syncytium atrophies often in patches. Fibrinous infarcts surround the villi, showing that the placenta is senile. In the maternal blood of the placenta, thrombosis occurs in the sinuses with the appearance of giant cells."

THE GROWTH OF THE FŒTUS.

Weight and Length.—The precise determination of the age of a given specimen are matters which have occasioned prolonged research, and which have not yielded satisfactory results. As regards the size of the fœtus at various periods of gestation, Hecker's data of weight are tabulated as follows:

Month.	Maximum.	Minimum.	Average.
Third	20 grammes.	5 grammes.	11 grammes.
Fourth	120 "	10 "	57 "
Fifth	500 "	75 "	284 "
Sixth	1280 "	375 "	634 "
Seventh	2250 "	780 "	1218 "
Eighth	2438 "	1093 "	1569 "
Ninth	2906 "	1500 "	1971 "
Tenth	. . . .	1562 "	. . . .

For practical purposes the table proposed by Dührssen is convenient and fairly reliable:

At the end of 1 month . . . . 1 × 1 = 1 cm. = $\frac{4}{9}$ inch.
At the end of 2 months . . . . . . 2 × 2 = 4 cm. = 1$\frac{7}{9}$ inches.
At the end of 3 months . . . . . 3 × 3 = 9 cm. = 4 inches.
At the end of 4 months . . . . 4 × 4 = 16 cm. = 7$\frac{1}{9}$ inches.

At the end of 5 months . . . . $5 \times 5 = 25$ cm. = $11\frac{1}{8}$ inches.
At the end of 6 months . . . . $6 \times 5 = 30$ cm. = $13\frac{1}{4}$ inches.
At the end of 7 months . . . . $7 \times 5 = 35$ cm. = $15\frac{3}{8}$ inches.
At the end of 8 months . . . . $8 \times 5 = 40$ cm. = $17\frac{7}{8}$ inches.
At the end of 9 months . . . . $9 \times 5 = 45$ cm. = 20 inches.
At the end of 10 months . . . . $10 \times 5 = 50$ cm. = $22\frac{2}{8}$ inches.

To obtain the length of the fœtus, multiply the month of pregnancy (first, second, etc.) by a coefficient—one for the first month, two for the second, etc., up to five. After the fifth month the coefficient remains five. Thus, at the seventh month the fœtus is 7 x 5 centimetres long, 35 cm., or 15 inches.

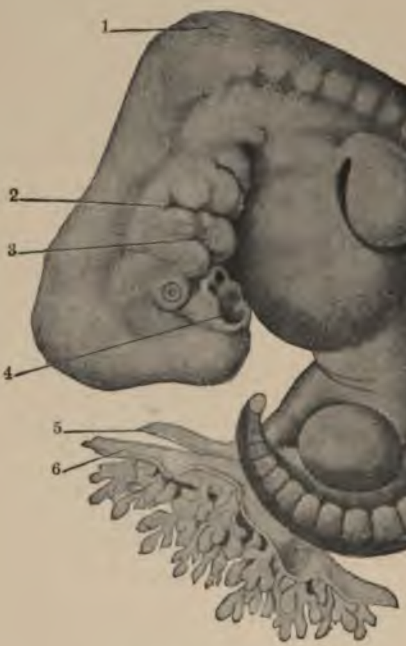
The Comparative Development of the Placenta and the Length of the Cord.—An indication as to the comparative development of the fœtus is often sought in the size of the placenta and the length of the cord. Hecker's statement is as follows:

Month.	No. of Observations.	Placenta.	Cord.
Third	3	36 grammes.	7 cms.
Fourth	17	80 "	19 "
Fifth	24	178 "	31 "
Sixth	14	273 "	37 "
Seventh	19	374 "	42 "
Eighth	32	451 "	46 "
Ninth	45	461 "	47 "
Tenth	62	481 "	51 "

Variations in the Weight of the Fœtus.—The weight of the fœtus at various periods of gestation varies greatly. The factors which have to do with the size of the fœtus are many, and are not accurately known. Besides the general conditions which influence nutrition, such as abundance of food or deprivation, exhausting labor, or rest and freedom from mental anxiety, the prolongation or the interruption of gestation probably influences the size and weight of the fœtus more than any other known factor. It is natural to expect that very young mothers, bearing children prematurely, as they do, should have small children, while children born of mothers at the period of greatest maturity and development, between thirty and thirty-five years, are largest and best proportioned. Gassner states that the child's weight is $5\frac{23}{100}$ per cent. of that of the mother. Frankenhaüser finds a proportion between the height of the mother and the weight of the child. According to him, when the mother is shorter than 4 feet 6 inches the child weighs six pounds and fifteen ounces. When the mother's height varies from 4 feet 6 inches to 4 feet 11 inches the child increases ten ounces in weight; while if the mother is taller than 4 feet

11 inches the child weighs over seven pounds. It is undoubtedly true that the weight of the child increases with successive pregnancies when the conditions of maternal nutrition are favorable. Negri, from 333 cases, asserts that the children of women who menstruated early are larger than the children of women who developed late.

FIG. 34.

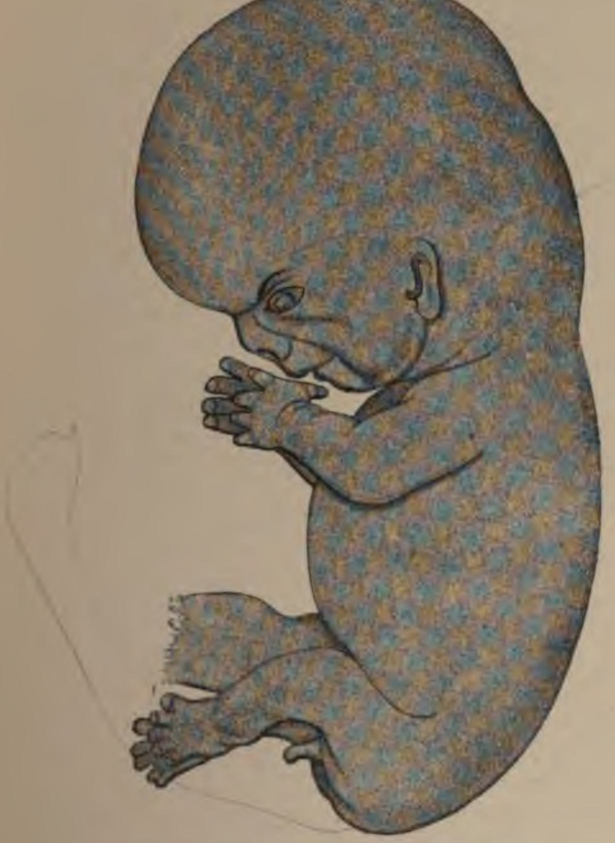


Embryo of four weeks. (HIS.)
1 Cervical spine. 2. Gills (aural opening.) 3. Mouth-fissure. 4. Nostrils. 5. Amnion. 6. Chorion and villi.

The Development of the Embryo of Different Periods.—An examination of embryos of various ages, as given in detail in works upon embryology, affords information of practical value. Specimens examined, aged from twenty-three to twenty-eight days, are enclosed in the chorionic vesicle, and show the embryo in a highly curved condition; the outline of the head is faintly indicated, the region of the neck is strongly bent, the allantois is partially closed, while its pedicle forms the umbilical cord, short and thick. At the end of the first month the embryo has begun to straighten its body, and the rudimentary limbs have lengthened. At thirty-eight days the outline of the fœtus has become distinctly that of the human being. The head has risen, the back become more straight, and the ventral surface of the body is evidently outlined. At fifty days the nose, mouth, and chin can be plainly determined; the cornea and conjunctivæ are separated, the fingers are well developed, and the toes are beginning to divide. At sixty days the soles of the feet are turned toward one another, the toes are free, and the hands are lifted toward the face. At seventy-five days the fœtus has the outline of a young child, with large head and slender body. The beginnings of the nails can be recognized.

Most abortions occur at three months, at which the fœtus presents the outline illustrated in Plate XII. The eyelids are closed, while the nose and lips are broad and thick, and the chin is pointed. At four months the outline of the fœtus resembles still more that of the young child, the limbs being flexed, but the head remaining considerably larger in proportion than is the body.

FIG. 35.



Nine weeks' embryo. Magnified four times. (His.)

Summary of Fœtal Growth.—Ballantyne arranges the changes characteristic of fœtal life into two groups—those typically fœtal and those embryonic; in the former, rapid growth in weight and length during the eight lunar months of fœtal existence. The increase in weight is from 1-9 of an ounce at six weeks to 7½ pounds at full term, while that in length is from 1.5 cms. at six weeks to 51 cms. at full term. The most active growth in weight is from the sixteenth to the twentieth week, when the weight quadruples; during the next month it nearly trebles; during the next it does not double, and from that its monthly gain is about one-half. The greatest gain in weight follows the full development of the placenta. The weight of the placenta increases in like proportion with that of the fœtus. The placenta much sooner lessens its rate of growth, having a shorter life history.

The embryonic changes are marked in the early months. The central part of the body and the viscera of the thorax and upper part of the abdomen show little changes, while the cephalic and caudal ends, with their viscera, the skeleton, the skin, and the limbs show alterations of a developmental kind.

The Full-Term Fœtus.—The characteristics of the fœtus at term, upon which reliance may be placed in estimating the degree of vitality of the fœtus, are of considerable practical importance. Stress has been laid by various writers upon some one characteristic upon which a positive assertion that the fœtus is at term may be based. Such a method of estimation is, however, erroneous, and a true conception of the development of the fœtus can be arrived at only after taking into consideration its proportions, weight, and general development. The fœtus at term measures about 50 cms. in length, and has definite proportions in the size of the trunk, of the shoulders, and of the head. If the circumference of the chest be measured at the region of the nipples, it will be found to be 35 cms.; the average fœtus being 50 cms. long. If the circumference of the head be measured, passing the tape-line around the forehead and the occiput, the measurement of the average head at term will be 2 or 3 cms. greater than the circumference of the chest, or 37 to 38 cms. When the proportions between the head, the chest-circumference, and the length, already stated, are reversed, the fœtus is not at term, or has been the victim of some disease which has profoundly altered its growth and development. When the measurement about the shoulders, taken just below the acromial process, is less than 32 cms. the fœtus is not at the full period of viability. Before the fœtus has arrived at term, the difference between the circumference of the chest and that of the head is very much greater than that just stated. In connection with these measurements the weight of the child is of considerable importance, and it is not common for a child born of healthy parents to weigh less than six pounds at delivery at term. In addition to these data, the plumpness and firmness of the child's flesh, the color and bright appearance of the eyes, the freedom and strength of its movements, the vigor of its cry, the strength and rhythm of its heart-beat, all show that normal development is complete or that it has been but partly accomplished. The exact determination of the period of viability is a difficult matter; instances are on record where a fœtus, supposed to be twenty-six weeks old, has grown and thrived. In view of the uncertainty attending calculations based upon data only, it is well, in endeavoring to determine the viability of a fœtus, to examine carefully the mother's abdomen before labor to ascertain the period of gestation. In cases where the question arises regarding the viability and period of development of the child, more information can always be obtained by thorough physical examination than by any computation from data given by the mother as to the period of gestation. In another portion of this book we shall describe alterations in the shape and color of the face and head which occur soon after birth.

The Development of the Genital Organs.—From the Wolffian duct and also the duct of Müller are gradually developed the uterus and its appendages. From the early ovarian follicles the ovary is gradually developed, while the Müllerian duct, at first double, becomes by the disappearance of its partition a single duct, which forms the uterus and vagina. The rudimentary Wolffian duct persists in the duct of Gärtner; it forms the parovarian duct, which, with the epoöphoron, are found in the broad ligament, sometimes styled the "organ of Rosenmüller." The upper portions of the Müllerian ducts do not unite, but form the Fallopian tubes or oviducts, while the funnel-shaped extremities of the Müllerian ducts become the fimbriated extremities of the Fallopian tubes. It is easy to understand, from the development of the genital tract in the female, those cases of double uterus and vagina which sometimes occasion perplexity in the examination of patients.

The Fœtal Circulation.—The fœtal circulation may be conveniently studied, as it is found during the first four months of gestation and also during the latter half of pregnancy. The essential differences between the circulation of the embryo and fœtus and that of the adult human being are such as naturally result from the fact that respiration is not established before birth. The pulmonic circulation before birth is reduced to a minimum, only sufficient blood being sent to the lungs to maintain the nutrition and growth of these organs. The functions of the right heart are reduced to a minimum before the birth of the fœtus, while the absence of pulmonary circulation affects the metabolism of the liver and renders unnecessary the very extensive circulation of blood found in this organ in the adult individual. As early as the twenty-third day the vessels of the yolk and the allantois become disconnected from the sinus venosus which surrounds the embryo, and the blood on its way to the heart is obliged to pass through the capillaries of the liver. The ductus venosus gradually develops between the portal vein, just before it enters the liver, and the right hepatic vein. This duct increases rapidly in size, affording a convenient channel for the placental blood to reach the heart without traversing the liver.

The Embryonal Circulation. — The course of the circulation of the embryo during the first four months of pregnancy is well described by Marshall, essentially as follows: "Up to the end of the first month the blood returning to the heart, both from the embryo, placenta, and yolk-sac, enters the sinus venosus, and thence through an aperture into the heart passes into the single auricular cavity. The blood in the heart is necessarily completely mixed, and the blood passes out from the heart through the arterial trunk in a similarly mixed condition. After the venous sinus joins the heart in the second month, three separate openings are observed into the right auricle; these are the openings of the right and left Cuvierian veins and the posterior vena cava. The septum between the auricles is partially formed, but the foramen ovale permits free communication between the auricles. The opening of the posterior vena cava lies nearest to the foramen ovale, while the blood is directed by the Eustachian valve, composed of a fold of the wall of the auricle along the right side of the opening, which directs the blood from the posterior vena cava through the foramen ovale into the left auricle. At this period of development the foramen ovale is simply an opening in the auricular septum, without valves, so that a certain amount of direct mixture of the blood must occur. During the third and fourth months, by the disappearance of some of the Cuvierian veins, the whole blood from both sides of the head and from both upper limbs is returned to the heart by what is styled the anterior vena cava. Aside from the coronary sinus, which is very small, but two bloodvessels at this period bring blood to the right auricle; the anterior vena cava, which brings venous blood from both sides of the head and from both arms, and the posterior vena cava, which returns arterial blood from the placenta and from the posterior portion of the embryo and from the yolk-sac. During the fourth month the Eustachian valve gradually develops, permitting the blood to pass from the right to the left auricle and preventing its return. The valve increases in size, and, owing to changes in the position and direction of the mouth of the posterior vena cava, the whole of the blood returned by this vessel is discharged through the foramen ovale into the left auricle."

The Fœtal Circulation at Term.—In the latter portion of gestation the right auricle receives blood from the anterior vena cava, from the coronary sinus, and the posterior vena cava. The anterior vena cava brings venous blood from the head and arms; the coronary sinus returns venous blood from the walls of the heart; while the posterior vena cava, the largest of the three, brings blood from the posterior portion of the body, the kidneys, and lower limbs, and also from the placenta, intestine, and liver. The right allantoic vein, through which blood returned from the placenta in early development, disappears. The left allantoic vein enters the body at the navel, running forward to the posterior border of the liver. Here it meets the hepatic portal vein, bringing blood from the intestine. When the blood from the mother reaches the liver two channels exist by which it can enter the posterior vena cava. A portion of the blood goes through the afferent hepatic vessels into the liver, and thence through the hepatic veins to the posterior vena cava. The greater portion of the blood passes through the wide ductus venosus into the posterior vena cava without going through the liver. The blood returned to the heart through the posterior vena cava comes largely from the allantoic vein. It is purer and more free from nitrogenous excreta and richer in nutrient material than the blood returned by the anterior vena cava. The blood in the anterior and the posterior venæ cavæ may be termed venous and arterial blood, respectively. The venous blood from the right auricle brought by the anterior vena cava passes, when the auricle contracts, into the right ventricle; thence it is sent through the pulmonary trunk, a small portion only going through the pulmonary arteries of the lungs; and as the lungs are unexpanded, there is considerable resistance to the blood, and but a small portion enters the pulmonary tissues. Almost the entire venous blood from the pulmonary trunk goes through the ductus arteriosus to the aorta, passing down to the bifurcation into the common iliacs, then along the bloodvessels of the lower extremities, but chiefly through the allantoic arteries to the placenta, where it gains nutrient matter and oxygen, and from which it returns through allantoic or umbilical veins.

The arterial blood coming through the posterior vena cava does not enter the cavity of the right auricle, but passes by the Eustachian valve through the foramen ovale into the left auricle; here is added the very small quantity of blood coming from the unexpanded lungs through the pulmonary veins. The blood passes from the left auricle into the ventricle, thence along the systemic trunk through carotids and subclavians to the head and arms. Very little blood from the left ventricle enters the dorsal aorta, for this vessel is already full of blood obtained from the right ventricle through the ductus arteriosus; at this period of development the walls of the two ventricles, being equal in thickness and strength, exert an equal pressure upon the blood of the right ventricle to pass along the arch of the aorta, and upon the blood of the left ventricle to pass backward along the dorsal aorta.

Malformations have been observed in which the aorta was obliterated just in front of the point where it is joined by the ductus arteriosus, and without any essential disturbance to fœtal circulation or to fœtal development. In such a condition, however, the fœtus must perish whenever the placenta separates from the wall of the uterus.

Changes in the Fœtal Circulation at Birth.—Following the separation of the placenta at the birth of the child the placental circulation is arrested and the vessels of the cord interrupted, while, as the lungs become inflated, the pulmonary circulation is established. The ductus arteriosus and the hypogastric or allantoic arteries shrink and become gradually obliterated. The ductus venosus and that part of the allantoic vein within the body of the child also become obliterated, while the foramen ovale closes. Through these changes the blood in the posterior vena cava, entirely venous in character, cannot pass into the left auricle because the foramen ovale has closed, but, joining with the blood from the anterior vena cava, passes from the right auricle to the right ventricle. From the right ventricle, owing to the obliteration of the ductus arteriosus, it cannot pass into the aorta, but proceeds through the whole length of the pulmonary arteries to the lungs. It is returned by the pulmonary veins from the lungs to the left auricle, thence to the left ventricle, which sends it to the head and upper limbs and also to the lower extremities. The obliteration of the ductus venosus sends the blood in the hepatic and portal veins through the capillaries of the liver to reach the posterior vena cava. By three changes—obliteration of the ductus arteriosus, obliteration of the ductus venosus, and closure of the foramen ovale—the fœtal circulation has become that of the adult. These changes do not, however, take place instantaneously with birth, nor do they happen simultaneously. The allantoic or hypogastric arteries are first obliterated, partly by contraction of the entire vessels, but chiefly by thickening of their inner coats, the whole process usually complete by the third or fourth day after birth. The allantoic veins and the ductus venosus remain open until the sixth or seventh day. The ductus arteriosus is usually closed by the eighth or tenth day, and is completely impervious in about three weeks. The last of all changes in the fœtal circulation is the closure of the foramen ovale; this closure is produced at first by the valve itself being kept closely applied to the margins of the foramen by the pressure of the increased quantity of blood returned by the pulmonary veins. Later, the edge of the valve gradually coalesces with the margin of the opening, but perfect closure is not complete oftentimes for some months. An oblique valvular aperture, large enough to admit a probe, often persists for the first year of infancy, and may even remain throughout life; in these cases venous blood passes into the left auricle whenever the patient's heart is aroused to violent action, as in overexertion.

THE PHYSIOLOGY OF THE FŒTUS.

A complete account of the physiology of the fœtus is beyond the scope of a work upon obstetrics, but a summary of this subject will afford indications for the management of the newborn child and explain many of the phenomena observed in obstetric practice.

The Cardiac Action of the Fœtus.—The heart action of the fœtus is the clearest demonstration in most cases which the fœtus gives of its existence. The study of embryology shows us that the heart beats from the sixth week to the time of birth, and continues after successful parturition. The heart of the embryo and fœtus beats automatically without immediate dependence upon the presence of oxygen in the blood. Neugebauer[23] describes a case of ectopic gestation at fourteen weeks. During operation the greater part of the body of the embryo was torn away, and still the heart continued to beat for more than three hours. The contractions began at the ventricles, extending to the auricles, the apex moving upwards, forwards and to the right.

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[23] Neugebauer: Centralblatt für Gynäkologie. No. 22, 1898.

Others report similar cases. Ballantyne[24] met with a case in which the heart beat continued for five hours after the birth of a fœtus which did not breathe. From the fifth month to full term the rate of the fœtal heart beat is 132 per minute, occasionally slackening to 100 or rising to 180. Occasionally the fœtal heart can be felt through the mother's abdomen. Pestalozza[25] in a case of twin labor could feel the fœtal heart through the mother's abdomen in the second twin. The rate was 140 per minute. Three tracings were obtained with a sphygmograph, two between pains and one during a contraction. The membranes of the second twin were intact. There was no slowing of the heart beat between the uterine contractions, but the tracings showed a rapid rise of pressure to the apex, followed by a continuance of pressure and then by descent to the base line, indicating the gradual decrease of pressure with the slow passage of blood out of the ventricles. Tracings of the pulse of newborn infants showed relatively high tension, a well-marked apex, and tidal and dicrotic wavelets.

The Fœtal Blood.—Numerous observations show that the fœtal blood is rich in red corpuscles, containing a considerable excess over that of the mother. Sfameni[26], from analyses of the blood of the placenta, finds that fœtal blood contains more water and less mineral matter, with more inorganic substance, than that of the mother. Nicloux[27] found carbonic oxide in small quantities in the blood of newborn infants. Halban and Landsteiner[28] find a marked difference in the reaction of fœtal blood. The serum of the fœtal blood undergoes solution with a smaller number of corpuscles than that of the mother. Fœtal blood agglutinates blood corpuscles less actively than the mother's, and has a feebler action against bacteria and fermentation. While the active principles of serum are present in the blood of the fœtus, they are much less developed than in the blood of the mother. In addition to the red corpuscles of the fœtal blood, numerous nucleated xanthocytes are found and other cells of transitional variety. The hæmoglobin of fœtal blood is in excess of that in the mother, averaging, according to Bidone and Ferroni, 120°, Elder and Hutchinson[29] giving them as 18,000 per cubic millimeter, or twice as many as in the adult.

Cavazzani and Levi[30] find no correspondence between the quantity of urea in the maternal and fœtal blood. The average quantity in the fœtal blood is 0.215 per thousand. There is more glucose in the maternal than in the fœtal blood. Sfameni[31] has shown that nucleon exists in the fœtal blood. The density of the fœtal blood is 1,060. Hugounenq[32] has found that from 50 to 60 per cent. of the total amount of iron in the body is in the fœtal blood.

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[24] Ballantyne: loc. cit.

[25] Pestalozza: Ressegna d. sc. med., Modena, VI., 405, 473, 1891.

[26] Sfameni: Annali di Ostetricia, November, 1899.

[27] Nicloux: L'Obstétrique, January 15, 1902.

[28] Halban and Landsteiner: Archives Anatomical Institute of Vienna.

[29] Elder and Hutchinson: Transactions Edinburgh Obstetrical Society, Number 20, p. 154, 1895.

[30] Cavazzini and Levi: Annali di Ostetricia, 16, p. 456, 1894.

[31] Sfameni: Annali di Ostetricia, xxii., 1009, 1900.

The Development of the Fœtal Blood.—Numerous researches show that blood cells in the fœtus originate in the liver, in the spleen, possibly in the thymus gland and lymphatic glands. Varaldo[33] found more leucocytes in the umbilical vein than in the umbilical arteries. This supports the view that there is a physiological migration of white corpuscles from the maternal to the fœtal blood. These cells carry with them substances whose precise composition is unknown.

Fœtal Oxygenation.—It has long been known that the red blood corpuscles of the mother are the source of oxygen for the fœtus. Interference with the current of blood in the umbilical cord at once causes evidence of asphyxiation in the fœtus. The spectroscope shows oxyhæmoglobin in the blood of the fœtal veins. The current is occasionally reversed, and oxygen may pass from child to mother when the mother becomes asphyxiated.

The Osmotic Pressure Between the Blood of Mother and Child.—This important point has received recent study by the method of ascertaining the freezing point of blood plasma, blood serum, and blood corpuscles. This method is called cryoscopy. Füth[34], by this method, found the osmotic pressure in the blood of the mother and child to be practically the same at the end of the expulsive period of labor. Veit[35] found that the membranes act as a dializing agent in but a very slight degree. It is probable that the interchange of saline substances and other matters passing from mother to child takes place through the cells of the placenta, and especially those of Langhans' layer. Kroenig and Füth[36] not only examined blood serum, plasma, and corpuscles by cryoscopy, but took the blood from the mother from a vein in the arm or from the retroplacental hæmatoma, and also from the umbilical cord during labor, to determine the question of osmotic pressure. They conclude that fœtal and maternal blood are isotonic with equal pressure. Resinelli[37] found by the same method that the average blood pressure of mother and fœtus is less than that of the average healthy adult. In twin pregnancies the coagulating point in the blood of one fœtus may be different from that of the blood in the other. Osmotic pressure in the amniotic liquid is constantly less than that of the maternal and fœtal blood. D'Erchia,[38] from chemical studies, found that the amniotic liquid has inferior osmotic pressure to the blood of mother or child. The membrane of the ovum is practically impervious.

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[32] Hugounenq : Journ. de physiol. et de path. gen., i. 703, 1899.

[33] Varaldo : Annali di Ostetricia, 7, p. 723, 1902.

[34] Füth : Centralblatt für Gynäkologie, No. 18, 1901.

[35] Veit : Zeitschrift für Geburtshülfe und Gynaekologie, Band 42. Heft 2, 1900.

[36] Kroenig und Füth : Monatsschrift für Geburtshülfe und Gynaekologie, Band 13, Heft 2, 1901.

[37] Resinelli : Annali di Ostetricia, November, 1901.

[38] D'Erchia : Annali di Ostetricia, No. 2, 1902.

The Temperature of the Fœtus.—Fœtal temperature is usually above that of the mother. If the mother's temperature rises much above 42° C., the fœtus will die. In animals the fœtus survives a temperature of 41° C. for two hours, and a loss of maternal heat of 6° C. in half an hour need not be fatal to the fœtus. So far as the fœtal temperature itself is concerned, observation shows it to be 1 to .2 of a degree Centigrade higher than that of the mother. When the fœtus dies, its temperature sinks. The temperature of the amniotic liquid is intermediate between mother and fœtus. Of twins, the heavier and stronger has the higher temperature.

The Chemical Composition of the Fœtus and Placenta.—Fehling shows that at full term the fœtus contains 74.4 per cent. of water, 25.6 of fixed substances, while the adult body has much less water and much more solid. The fœtus gains water as it develops. Mineral matter increases gradually to about 3 per cent. Fat increases to 9 per cent., and albuminous substances to between 11 and 12 per cent. The greater mineral constituent is salts of iron. Mother's milk is relatively deficient in iron, and apparently the fœtus is provided for separately from this source. As the fœtus stores up iron in the latter part of pregnancy, the mother's reserve diminishes. Charrin and Levediti[39] found that the spleen of the pregnant animal showed marked loss of iron. Lime increases during the last month.

The Chemistry of the Placenta.—Grandis and Sfameni[40], from analyses of the placenta, show the large quantity of phosphorus found, its compounds being extracted with water and precipitating with albuminous substances. Sodium compounds are in excess of potassium, and lime is in excess. Obstetricians frequently observe placentæ at full term with abundant concretions of lime upon the inner surface. The children in these cases are often exceedingly well developed.

The Nutrition of the Fœtus.—Ballantyne[41] concludes that the amniotic liquid is but a small source of food supply to the fœtus, even in the later months. The umbilical vesicle and its vessels cease early in gestation to nourish the embryo, while the placenta is evidently the most important organ concerned in fœtal nutrition. That substances pass from mother to child has long been known. Chloroform, salicylic acid, iodide of potassium, alcohol, mercury, and methylene-blue have been noted. Nicloux[42] found that alcohol administered to a parturient woman about an hour before labor could be extracted from the blood of the umbilical cord. Infections are evidently transmitted from mother to child. The agents of transmission are probably the leucocytes found in the umbilical vein. That the placenta has a further function than simply to transmit is probable, but cannot be distinctly proven. It must have power of selection to enable the child to acquire iron, potassium and lime in the later months of pregnancy, although some of these substances are deficient in mother's milk. Porak[43] found that the placenta could store up mercury, and others have shown that it can accumulate microbic poisons and glycogen. In this it resembles the liver. Others suggest that the placenta furnishes an albumenoid secretion. We must not forget that the placenta grows at an equal rate with the fœtus.

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[39] Charrin and Levediti: Journ. de physiol. et de path. gen. 1, pp. 772, 1899.

[40] Grandis and Sfameni: Arch. ital. de biol., XXXIII., pp. 429, 439, 1900, and Sfameni: Annali di Ostetricia, XXI, 851, 1899, and XXII, 1009, 1900.

[41] Ballantyne: loc. cit.

[42] Nicloux: L'Obstétrique, p. 97, 1900.

The Fœtal Secretions.—There is abundant evidence that the fœtal liver is capable of functional activity at birth. Its glycogenic function has been demonstrated. There is bile in the gall bladder during fœtal life, as repeatedly shown. In the newborn child ptyalin is usually found, and pepsin is present in the stomach. There is sufficient digestive power to take care of the albumenoid substance in the amniotic liquid. Pancreatic ferments are present to some extent. The skin of the child secretes abundantly, forming the vernix caseosa; the mammary glands in both sexes secrete, and the glands of mucous membranes are active.

Fœtal Excretions.—The most obvious of these is meconium, which distends the lower part of the intestine. This consists of swallowed liquor amnii, lanugo hairs, vernix caseosa, epithelial cells, bile, mucus, and the secretion of the intestines and pancreas. The color of meconium is ordinarily that of burned molasses, but when the bile ducts are congenitally absent meconium is yellow or gray. Chemical analysis shows that meconium contains about one-third of solid matter, peptones, albumen, leucin, tyrosin, and other organic compounds, and the products of decomposition are absent. Meconium is sterile, containing no bacteria which give culture growth. In addition to meconium, the fœtal bladder contains a fluid, specific gravity 1,010 or less, containing 0.15 per cent. of urea, considerable uric acid, chlorides, and kreatinin. Albumen is also present. Experiment shows that this fluid is fœtal urine, coming from the kidneys.

The placenta acts also as an excretory organ, and drugs injected into the fœtus pass to the mother. Toxines deposited in the fœtus can be transmitted to the mother, as shown by Charrin.[44]

The Function of the Fœtal Glands.—In the fœtal body the thymus, thyroid, adrenal, and pituitary glands have functions which pertain to the nutrition of the fœtus.

The Thymus.—The thymus gland, originally epithelial, changes to lymphoid structure at about the third month, but increases in weight at the sixth month, its structure becoming more complicated when infection is present. The exact functions of the thymus in fœtal economy are unknown. It seems in some way to be a preliminary body to the thyroid.

The Thyroid Gland.—While it is not known whether the thyroid before birth contains an internal secretion capable of acting as antitoxin, it is ascertained that after birth the thyroid has such a secretion called iodo-thyrin, exercising a medicinal effect upon toxic products of proteid metabolism. These principles are neutralized and stored up in the thyroid gland. It is possible that the hypertrophy of the thyroid seen in pregnant women is a measure to protect the fœtus from the results of infection. Some believe that the flow of milk at the third day of the puerperal period depends largely upon changes in the thyroid of the mother. Undoubtedly diseased conditions of the infant result because the fœtal thyroid, normal at birth, undergoes degeneration. Exophthalmic goitre is thought to result from the reappearance of a colloid material found in the fœtal thyroid. The removal of the thyroid in pregnant animals is followed by disturbance in the nutrition of the young. While it is improbable that the thyroid during fœtal life has the same activity which it shows after birth, it may protect the fœtus in cases of maternal disease, and is ready for development immediately after birth.

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[43] Porak: Arch. de med. exp. et d'anat. path. vi. 192, 1894.

[44] Charrin: Annales de Gynecologie et d'obst., 197, 1898.

The Suprarenal Capsules of the Fœtus.—In the mother the suprarenal capsules greatly atrophy during pregnancy, and in the fœtus these organs are relatively large. The physiological antagonism between the thymus and thyroid and suprarenal capsules calls attention to the fact that in pregnancy these glands are enlarged in mother and fœtus. Like the thyroid, while the suprarenal capsules in the fœtus are not active, they are in a condition to assume activity immediately upon birth.

The Pituitary Body.—From experiments, we are led to think that the secretion of this body is allied in action to that of the suprarenal glands.

Influences Determining Fœtal Growth.—So many causes influence fœtal growth that it is impossible to definitely state the most important factors controlling this phenomena. Clinical observation shows that the health of the mother and her food supply, her employment, the condition of the placenta, the perfection or deficiency of fœtal assimilation, and the condition of those secretory and excretory glands in mother and child which influence nutrition govern fœtal growth. It is interesting to observe that the fœtus lives upon the mother in a parasitic way, and that even if her supply of food is much reduced the fœtus continues to nourish independently of her nutrition. The type and development of the male parent have also a decided influence upon the nutrition of the fœtus.

Fœtal Movements.—Fœtal movements seem the result of automatic muscular action rather than stimulus from the cerebrum and cerebellum. In Onodi's case,[45] a monster without cerebrum and cerebellum survived birth for two days. Fœtal movements are independent of the supply of oxygen, and may persist after craniotomy. Rigor mortis may develop in utero, and is not infrequently observed.

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[45] Onodi: Monatsschrift f. Geburtshülfe und Gynäk., p. 718, 1900.

In addition to the ordinary movements of the fœtus, by which the position of the trunk or limbs is changed, we recognize rhythmical movements, apparently caused by the action of the diaphragm and intercostal muscles. Irritating substances in the blood of the mother can produce fœtal movements, and pressure upon the uterus often excites them. The fœtus sucks and swallows while within the womb. It is known that the application of cold to the abdomen stimulates fœtal movements. It is probable that other stimuli affecting the mother through sight, hearing, emotion, fatigue, or hunger influence the movements of the child. Mothers are sometimes greatly annoyed by excessive fœtal motion, and in some cases in which the walls of the uterus are very thin the suspicion of ectopic gestation may be excited by excessive fœtal movements.

Fœtal Sensation.—Reasoning from our observation of prematurely born infants, reflexes of taste, smell, and sound must exist in the fœtus before birth. The retina is sensitive to light, and the pupils react to drugs. So far as the mental condition of the fœtus goes, it must be described as that of practically continuous sleep.

CHAPTER VII.

THE PATHOLOGY OF THE EMBYRO AND FŒTUS.

In this complex study the English literature of medicine must acknowledge its indebtedness to Ballantyne, who, more than anyone else, has studied and written in this department.

Classification of Morbid Fœtal States.—The following is essentially Ballantyne's classification:

First. Transmitted Diseases and Toxicological States.
Second. Idiopathic Diseases.
Third. Neoplasms.
Fourth. Traumatic Morbid States.
Fifth. Diseases of the Fœtal Annexa.
Sixth. The Pathology of Fœtal Death.

The Effect of Intra-Uterine Environment upon the Fœtus and the Influence of the Placenta.—It is evident that the fœtus must be greatly influenced by its intra-uterine environment. The uterus and its contents efficiently protect the fœtus from injury in almost all cases. Instances of apparent fracture and traumatism must be received with skepticism, and are probably due to amniotic adhesions or vices in development. The fœtus may, however, have its diseases modified by the amniotic liquid which surrounds it, and by the temperature at which it is kept within the womb. The influence of intra-uterine conditions is seen most strikingly when the fœtus dies and maceration or mummification occurs. The former produces a softened condition of the fœtal tissues; the latter, a compressed and parchment-like state of the fœtal body. There is no evidence to lead us to believe that rigor mortis does not occur within the womb, and, on the contrary, it has been not infrequently seen.

The Placental Influence in Diseases of the Fœtus.—So long as the placenta remains practically intact, the fœtus may be totally diseased without dying. The placenta acts as a compensating organ for the fœtus, doing the work of those fœtal organs damaged by disease. The placenta undoubtedly fixes certain metallic poisons, accumulates glycogen, and in general protects the fœtus from injurious substances.

Regarding the protection of the fœtus from bacteria by the placenta, while this may often be accomplished, it is not invariably the case. Küss[46] has studied the transmission of tuberculous infection, and believes that in cases where bacilli penetrate the placenta, this organ retains power to make them practically inert as regards the fœtal body. The placenta undoubtedly lessens the number of germs passing to the fœtus, and thus protects it from injury.

On the other hand, through the adnexa of the fœtus some infections must pass, especially toxines. Ferrari,[47] by experiment, has shown that it is possible for infection to pass through the stomata of the amnion, and thus into the lymphatic system of the fœtus. In placental lesions the infection reaches the body of the fœtus through the blood, goes thence to the heart and is distributed. Primary pathological lesions in the fœtus are then most commonly found in the placenta, liver, or heart.

Lesions of the Placental Substance.—Usually placental disease means fœtal death, and in seeking the cause of death for any fœtus it is evident that not only must the fœtus be examined, but also its placenta. Complete specimens, then, must comprise the placenta as well as the fœtus.

It is also possible that disease may pass from the fœtus to the mother, although this is exceedingly difficult of direct demonstration.

The Embryonic Influence in Fœtal Disease.—In studying diseases of malformation of the fœtus, the fact cannot be ignored that the influence of development in the embryo must have considerable to do with fœtal disease. It is now questionable whether malformations result from perverted developmental activities of the fœtus or from diseases in the malformed part alone.

Variola.—Among diseases known to be transmitted to the fœtus is variola or smallpox, which is an irregular eruption, with few spots, white or pale yellow in color, with little suppuration or crust formation. Pustules have been found in the mouth, pharynx, and stomach, as well as upon the skin. The fœtus often recovers from intra-uterine smallpox.

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[46] Küss: De l'hérédité parasitaire de la tuberculose humaine. Paris, 1898.
[47] Ferrari: Lo. sperimentale p. 62, 1895.

Vaccinia.—While vaccination affords our only means of protecting the fœtus against variola, we must remember that protection by vaccination during pregnancy is of short duration. But a few months' immunity is obtained in this way. If smallpox is epidemic during the early portion of a patient's pregnancy, she must be repeatedly vaccinated to secure protection.

Measles, Scarlet Fever, and Other Infectious Diseases.—Ballantyne publishes a noted case of fœtal measles, and also one of fœtal scarlatina. Lebedeff[48] describes a very completely investigated case of erysipelas, and Bidone[49] adds a further case thoroughly investigated. Parotitis, influenza, pertussis, relapsing and yellow fever, cholera, and varicella occurring in the fœtus have all been observed. The writer[50] observed a case of catarrhal pneumonia occurring in the latter weeks of pregnancy which proved fatal to the mother. The infant was born during the mother's illness, passed through the pneumonia and survived.

Fœtal Typhoid.—This subject has received thorough investigation by microscopic examination and the use of the Widal test. The agglutinating principle is thought by some to be transmitted to the child without the actual disease, but this is denied by others. There can be no question of the transmission of the germs causing the disease from mother to child. The fœtus may be materially injured by typhoid infection in addition to the transmission of the disease itself. The writer has had occasion to observe the case of a young woman suffering from impaired development of speech and hemiparesis as the result of a severe typhoid infection in her mother before her birth.

Fœtal Malaria.—Abundant evidence shows that the fœtus may have malarial infection within the uterus, and have at birth the enlarged spleen characteristic of this condition. It is made delicate and puny by the mother's infection, and rarely has a partial immunity as the result. There is no evidence that quinine given to prevent fœtal malaria influences the fœtus injuriously. It may be used as freely as in the non-pregnant patient.

Fœtal Tuberculosis.—While the existence of this condition must be acknowledged, it is comparatively rare. It is not often pulmonary. It is found most frequently in the liver and along the blood current. It develops especially well in the fœtus, and there may be a comparatively small number of characteristic lesions. If the fœtus survives sufficiently long, the process may become one recognized as tubercular with difficulty. Tuberculosis occurring in the mother before the child's birth may undoubtedly injure the child, although a positive tuberculosis in the child may be lacking.

Fœtal Septic Infection.—This cannot be denied, and has been proven by bacteriological examination. Pure cultures of streptococci and other septic germs have been isolated from the fœtal body.

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[48] Lebedeff: Ejened. Klin. gaz. St. Petersb. Vi., 285, 1886.

[49] Bidone: Teratologie, i. 182, 1894.

[50] Davis: American Text Book of Obstetrics.

Severe infections, as cerebro-spinal meningitis, purpura, and anthrax have also been recognized in the fœtus.

Fœtal Rheumatism.—Ferguson[51] reports a case of well-marked rheumatism. The infant survived its birth ten days, and autopsy confirmed the diagnosis. Septic and gonorrhœal conditions in the joints must not be mistaken for rheumatism. Reaction to treatment by salicylate of soda is a useful method of confirming the diagnosis.

Fœtal Syphilis.—This is one of the most fatal and common of the affections which attack the unborn child.

Pathology of Fœtal Syphilis. THE PLACENTA.—Ballantyne, Fränkel,[52] Rosinski,[53] Wallich,,[54] and others have written extensively upon this subject. The placenta is larger and paler than normal, a pale red, with whitish yellow spots. It is softer than usual, and may be friable. Ruge[55] draws attention to the fact that in the healthy fœtus the weight of the placenta is as 1 to 6, whereas in the dead syphilitic fœtus the ratio is 1 to 4.

On microscopic examination the essential lesion is inflammation of the bloodvessels. Endarteritis is extensively found with beginning thrombosis. These changes are most often found in the villi, while the stroma and epithelial covering show inflammatory proliferation. The villi are hypertrophied with fibrous degeneration. By this means a gradual anæmia results in the placenta. Extravasations of blood are found in the maternal portion, thus increasing the tendency to fœtal death and separation of the placenta.

THE UMBILICAL CORD.—In fœtal syphilis the vessels of the cord are greatly thickened, with tendency to the formation of thrombi.

THE AMNIOTIC LIQUID.—An excessive amount is often seen in syphilis, probably due to increased pressure in the umbilical vein from syphilitic deposits in the fœtal liver or hemorrhages in the cord or placenta. Lesions in the heart and lungs are sometimes found in the syphilitic fœtus. Hydramnios indicates disease of the fœtal viscera, and hence is valuable as an indication in syphilis.

THE LIVER.—Syphilitic changes in the liver have received much attention. The first to write extensively was Gubler, in 1849. Ballantyne states that the liver of a syphilitic fœtus may exhibit no alterations whatever. In other cases, if the fœtus has died in utero, the changes are simply those of maceration in many cases. The liver is full of small white spots, the color of flint. Under the microscope, a diffuse interstitial sclerosis is found. Gumma are rarely seen in the fœtal liver, and show a more advanced stage of syphilis. Associated with these changes there may be degenerative changes which are not necessarily syphilitic.

THE LUNGS.—Syphilitic changes in the fœtal lung much resemble those of the liver. Sometimes thickened patches, whitish in color, are found or a diffuse infiltration or gummatous growths surrounded by pneumonia or chronic pneumonia.

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[51] Ferguson: Edinburgh Hospital Reports, p. 608, 1893.
[52] Fränkel: Archiv für Gynäkologie, Band 5, Heft 1, 1873.
[53] Rosinski: Dissertation: Königsberg, 1889.
[54] Wallich: Rev. prat. d'obstetrique XI. p. 33, 1898.
[55] Ruge: Zeitschrift f. G. und G. Band 1, 57, 1877.

THE CIRCULATORY SYSTEM.—Endarteritis has already been described as characteristic of syphilitic disease. Cima[56] found hæmoglobin diminished, red cells altered, but no unusual leucocytosis.

GLANDULAR ORGANS.—Changes in the thymus and suprarenal capsules, spleen, and pancreas are essentially the results of lesions of the bloodvessels in these organs. The kidneys are enlarged, and Hecker[57] found the kidneys of the syphilitic fœtus 1-86 the weight of the body, instead of 1-123 of the body weight. Hecker and Karvonen[58] found infiltration of the vessels of the cortex with the growth of connective tissue between the vessels. Lesions of the parenchyma of the kidneys do not usually develop unless the fœtus has survived birth.

THE INTESTINES AND PERITONEUM.—It is impossible to recognize accurately distinct lesions in the intestines and peritoneum as the result of syphilis. Changes formerly ascribed to syphilis are those often seen in cases where syphilis is not present.

THE SKELETON.—Fœtal bones have long been considered the especial site of the lesions of syphilis. Wegner[59] drew attention to a yellow line separating the shaft of a long bone from its epiphysis. This is seen best in the femur or tibia, and the bone should be split vertically with a strong knife. Other degenerative changes are seen in the skeleton. (Plate IV.)

THE SKIN.—The syphilitic fœtus is not infrequently born with a fully developed pemphigus. Ichthyosis is also seen in many of these cases. This passes gradually into the macerated condition of the skin, often found in the syphilitic fœtus. Attention must be called to the fact that while the dead and syphilitic fœtus macerates, the fœtus dying from other conditions will do the same, and hence that maceration is not an invariable sign of syphilis.

Dystrophies of Syphilis.—Attention must be called to the interference with development which syphilis brings about. Fournier[60] believes that syphilis is not only transmitted as a disease, but that various pathological conditions not syphilitic are transmitted from syphilitic parent to child. Thus we find the simian or senile physiognomy of the syphilitic fœtus, the dwarf fœtus, and the fœtus with exostoses. The cranium may be extensively altered, and microcephaly or hydrocephaly may be present. The jaws may be malformed, some of the teeth may be absent, and the teeth may be soft and brittle; there may be hare-lip, cleft palate, or deformity of the nose or ear; in the spine, scoliosis and spina bifida have been observed. Malformation of the limbs in the joints and phalanges are also reported; patho-

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[56] Cima: Pediatria, Vol. 6, No. 12, 1898.

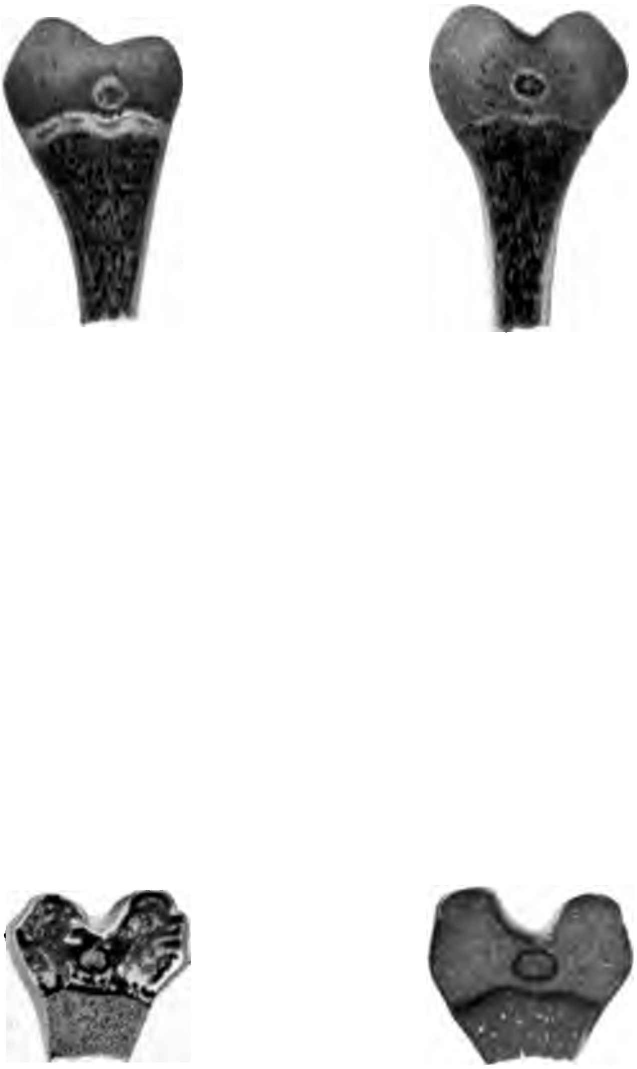
[57] Hecker: Jahrbuch für Kinderheilkunde, Vol. i, p. 375, 1900.

[58] Karvonen: Die Nieren-syphilis, Helsingfors, 1898.

[59] Wegner: Arch. f. path. Anat. p. 305, 1870.

[60] Fournier: Stigmates dystrophiques de l'hérédo-syphilis. Paris, 1898.

PLATE IV.



Femur of Syphilitic Fœtus. (Rosinski.)

logical conditions of the brain and cord may follow. Anomalies of the heart and bloodvessels of the digestive and the genito-urinary organs and of the tissues developed from the skin may be present. The amnion may be deficient in development, and an hydatid mole may result. In extreme cases monstrosities are found. Syphilis may produce a deficiently developed mind in the fœtus, or may arrest development, causing idiocy. The syphilitic fœtus is predisposed to hemorrhages, to obesity, tuberculosis, and nervous diseases. From this extensive classification can be seen how serious is the occurrence of syphilis in fœtal life.

The Transmission of Syphilis.—This must usually be from the mother through the placenta, and occasionally the child may escape actual syphilitic infection. In most cases the fœtus is infected.

Immunity.—It has long been taught that children born healthy but of syphilitic parents are immune from syphilis. Recent investigation throws doubt upon this. Ballantyne believes that mothers syphilitic before conception rarely communicate the disease to their offspring in extrauterine life. If, however, the mother acquired syphilis after conception, the child might receive syphilis from its mother after birth. Recent writers believe that immunity from syphilis is but temporary, if it actually exists. It must also be remembered that while syphilis is developing in the fœtus, toxines formed by the syphilitic fœtus may be conveyed to the mother through the placenta.

Colles' Law.—By Colles' law is understood the fact that an apparently healthy mother giving birth to a syphilitic infant may nurse that infant without developing a mammary chancre. A clearer explanation of this phenomenon is not forthcoming, but it has been recognized, and is usually true. Hutchinson[61] believes that the mother is not absolutely immune, but that her risk is much less than that of another woman. We do not as yet understand the transmission or the effects of syphilis in the embryonic or germinal periods.

Results of Fœtal Syphilis.—Fournier regards syphilis as murderous to the fœtus. He considers syphilis, alcoholism, and tubercle as the three great enemies of fœtal life. The wide extent of syphilitic lesions may be inferred from de Armenteros' thesis,[62] in which he has collected thirty-eight cases of fœtal syphilis transmitted to the third generation. Fournier's tables indicate that when infection occurred before conception the mortality is 65 per cent. and the morbidity 70 per cent. When conception and infection occurred simultaneously, the mortality is 75 per cent. and the morbidity 91 per cent. When infection took place after conception, the mortality was 39 per cent. and the morbidity 72 per cent. Most disastrous is infection in the germinal period; least dangerous post-conceptional infection.

The mortality is modified by the transmitter. In paternal transmission alone the mortality is 28 per cent., the morbidity 37 per cent.

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[61] Hutchinson: Twentieth Century Practice. 1899.

[62] de Armenteros: Thèse Paris. 1900.

In maternal transmission the mortality is 60 per cent., the morbidity 80 per cent. When both parents transmit the mortality is 68.5 per cent., and the morbidity 92 per cent.

Most Fatal Period.—Observation shows that the three years following infection are most dangerous. Of these the first is worst of all, while the violence of the poison seems to abate as it goes on.

Treatment of Fœtal Syphilis.—The fœtus can be treated through the mother only, and the earlier the treatment is begun the better. It should be continued until the birth of the child, and then the child should be directly treated. Fournier and others believe that there is no contraindication to the administration of mercury to a pregnant mother. We may hope to avert the deforming and maiming effects of syphilis by vigorous and continuous treatment. Mercury may be used alone or with iodide of potassium. In the interests of the fœtus, mercury is most efficient when given alone. Mercury in 1 gr. doses two or three times daily is efficient. Riehl[63] treated syphilis in pregnant women by vaginal pessaries containing 1 gramme of the German mercurial ointment with cocoa butter. Mercury is also given by inunction or injection.

The Effect upon the Fœtus of Lead, Mercury, and Phosphorus.—There can be no question but that lead poisoning may be conveyed by the male or female parent to the fœtus. Among persons working in type-foundries cases have been observed in which the fœtus died in utero, or in which malformations in the cranium and diseases of the nervous system were present. Lesions of the liver and kidneys were found in these cases.

Mercury has been found in the placenta, amniotic liquid, and fœtus in the human subject and in animals by Strassman[64] and others. It seems fair to conclude that mercury given in the treatment of syphilis passes to the fœtus, liquor amnii, and placenta. It prevents abortion. In non-syphilitic women, mercury causes abortion, stillbirths, and congenital debility, but mercury is not so injurious as lead.

As regards phosphorus, changes similar to those found in the adult have been detected in the fœtus. Fatty degeneration of the liver, with extensive disintegration of the blood, are the principal lesions.

Poisoning with Toxic Vapor.—Coal gas poisoning and poisoning by carbonic oxide have been observed. The placenta, however, permits the passage of but small quantities of these gases to the fœtus, and the child dies more from the asphyxia of the mother than from alterations in its own blood.

Chloroform and Ether.—From a large number of observations, there is evidence for the belief that chloroform gas passes into the fœtal blood, but that in any ordinary and reasonable amount it produces no serious effects. The same is true of ether.

Opium.—Unquestionably, opium given to the mother in large quantities must affect the fœtus. Large quantities of opium at the time of labor predispose to asphyxia. The moderate use of opium has no ill effect.

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[63] Riehl: Wiener klin. Wochenschrift, No. 14, 1901.

[64] Strassman: Archiv f. physiologie, p. 95, 1899.

Tobacco and Alcohol.—It has been alleged that pregnant women working in tobacco factories frequently abort. It cannot be proven that such abortion is definitely the result of tobacco. After the children are born, however, there is a large mortality among infants born from mothers working in tobacco.

As regards alcohol, it is undoubtedly true that alcohol produces disease and death in the fœtus, and premature death, disease, and degeneration in infants born of alcoholic parents. Bourneville[65] found that of 2,554 children admitted to asylum suffering from idiocy, epilepsy, imbecility, or hysteria, 933 had drunken fathers, 80 had drunken mothers, and 40 had both parents drunkards; 41.1 per cent. of these children had drunken parents. In addition to the lesions of the nervous system commonly observed in infants born of drunken parents, malformations were not unusual in these cases.

Effects of Maternal Diabetes, Cancer, Eclampsia, Leukæmia, and Heart Disease.—Ballantyne states that others have frequently observed that a fœtus may be born of a mother suffering from one of these disorders and survive in apparent good health. Such lesions are seldom reproduced in the fœtus, because the lesion occurs in such a manner as to spare the fœtus sufficiently long to insure fœtal development. When such a condition becomes severe, the fœtus dies as the result of autointoxication and asphyxia.

These remarks receive illustration in a case in the experience of the writer. He delivered an infant by Cæsarian section from the mother dead of eclampsia. The child was apparently robust and healthy, a male and well developed. In spite of the best care and wet nursing, the child developed toxæmia about ten days after the mother's death, from which it died. Here the toxine of the mother's body evidently overwhelmed the fœtal organs of excretion, bringing about the fatal issue.

Fœtal Dropsy and Elephantiasis.—These diseases affect chiefly the subcutaneous tissues, and are probably transmitted. Fœtal dropsy may result from any lesion interfering with the circulation of the fœtus and placenta, and there is usually a history of polyhydramnios or some disease in the mother. The mother is usually above the average age of child bearing. Ill health in the mother, especially during the latter part of pregnancy, is usually noticed. Fluid is found in all the cavities of the body, and malformations of various organs are sometimes observed. The placenta is large, heavy, light in color, the cord thick and swollen and irregularly inserted in the placenta. Aside from its connection with ill health in the mother, the cause of fœtal dropsy is most obscure.

In elephantiasis the mother has usually been diseased in a similar manner. If the child survives in fairly good condition, it sometimes improves rapidly under treatment with iodide of potassium, elastic compression, and the use of electricity.

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[65] **Bourneville**: **Progrès Médicale**. No. 13, p. 263, 1901.

Disorders of the Skin in the Fœtus: Fœtal Ichthyosis.—The etiology of this condition is unknown; the lesion is essentially a hyperkeratosis, with alteration in the hair and glands of the skin. The body is covered with thick, horny, yellow plates of various shapes and sizes, between which are fissures of a red or bluish tint. The epidermic layer is harder than usual, the feet and hands are deformed, resembling birds' claws, and the epidermic layer of the skin is enormously thickened. Such infants are of feeble vitality, and usually perish soon after birth. In the milder types the skin is covered with a substance resembling collodion, which disappears by desquamation.

Thickening of the skin upon the soles of the feet and the palms of the hands, premature separation of the epithelia of the skin and the excessive development of hair have all been noted in the fœtus. Congenital hypertrichosis causes the production of monstrosities known as "hairy persons" or animal men.

Among the rare lesions of the skin are congenital absence, congenital alopecia, and antenatal pemphigus. Skin diseases in the fœtus occupy an intermediate position between malformations and diseases. Many of them may be more appropriately termed monstrosities than actual diseases.

Diseases of the Fœtal Skeleton.—While it is impossible to clearly describe the conditions of the fœtal bones in all cases, some of the more common lesions are sufficiently familiar to be recognized. Rachitic changes in the skull and ribs of the fœtus are frequently observed in children born of mothers who had lived in bad hygienic surroundings or were themselves the victims of rickets. Schwarz[66] found that in 500 infants born in the Vienna Obstetric Clinic, 80.6 per cent. showed rachitic changes in the skull or ribs. The mothers had nearly all lived under bad hygienic conditions. Fede and Caccace[67] believe that congenital rachitis is comparatively rare. They found but one case out of 500 showing all the features of rachitis, and only four exhibited craniotabes. This would give a frequency of congenital rachitis of about 4 per cent. of infants born in ordinary practise. Ballantyne is disposed to believe that Fede and Caccace are right in their estimate of the rarity of fœtal rachitis. While it may not be possible to distinctly outline typical rachitis in the fœtus, we must admit that in many cases changes occur in the fœtal cranium which produce abnormalities in the size and consistence of the skull, and which may lead to complications in labor. The writer has frequently found it necessary to undertake some obstetrical operation because the pelvis of the mother was below the average size and the cranium of the fœtus thicker than normal and shaped differently from the average cranium. This feature must also be taken into consideration in selecting an operation to save the life of the child in complicated cases. If fœtal life is to be preserved, Cæsarian section may become necessary in cases of this sort.

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[66] Schwarz: Med. Jahr. Vienna, 1887, p. 495.

[67] Fede and Caccace: Pediatria, vol. 8, p. 41, 1900.

Other diseases of the fœtal skeleton are sometimes observed, but they have not as yet been seen with sufficient frequency to secure accurate classification. They are not typical pathological processes, and it is with great difficulty that we form an idea of their origin. Most of them must be considered as monstrosities.

Fœtal Ascites, Peritonitis, and Disease of the Bile Ducts and Pylorus.—Fœtal ascites may be so extensive as to seriously complicate the delivery of the fœtus. It is often seen in cases of polyhydramnios, and usually occurs in cases in which some disorder was present in the mother during pregnancy. In many cases pregnancy terminates prematurely. This complication exposes the mother at labor to danger from the necessary manipulation to secure the delivery of the fœtus. Occasionally the fœtus survives extensive ascites, although it perishes during labor or soon afterward. This condition is accompanied by changes in the peritoneum, which are usually a most important cause in bringing about the ascites.

In many cases of peritonitis in the fœtus, the usual appearances of peritonitis are absent and the peritoneum is dry, granular in appearance, without much fluid. At other times fluid is present.

The bile ducts are occasionally obliterated congenitally, and the pylorus narrowed by congenital stenosis. There is no known cause for these phenomena, and no abnormality during pregnancy gives rise to a suspicion of their development. When the bile ducts are obliterated, jaundice is persistent, the stools are white in color, and the blood soon undergoes degeneration, with passive hemorrhage, and finally convulsions and death. When the pylorus is occluded, the infant vomits after birth, and soon can retain nothing upon the stomach. Constipation is present, and the pylorus can usually be felt by palpation through the abdominal wall.

Fœtal Endocarditis and Atheroma.—Fœtal endocarditis is not a very rare condition, and its characteristic lesions are frequently seen in thickenings of the endocardium, pathological conditions of the valves or contractions of the openings, or cavities of the heart. It is sometimes diagnosticated before birth by murmurs in the fœtal heart beat. The causation of this condition is not clearly known, but it is not invariably fatal. Where the lesions are not extensive, the fœtus may make a complete recovery. Atheroma is occasionally observed in the aorta and pulmonary artery in feeble infants. Its causation is unknown.

Fœtal Goitre.—Enlargement of the fœtal thyroid has not been infrequently observed. In some cases adenoma of the gland is seen, in others cystic changes, while in others the gland is simply congested more than normal. Enlargement of the fœtal thyroid impedes respiration, and may interefere with labor by occasional abnormal presentations. Congenital cases usually affect the male fœtus, and many consider them transmitted directly from the parents.

Diseases of the Fœtal Urinary Organs.—In some cases in which the mother's excretion is seriously impaired, chronic nephritis gradually develops in the fœtus. Albuminuria occurs independent of the mother's condition, and is usually transient in duration. The fœtal bladder may become enormously distended, simulating ascites and interfering with labor. In Fabrioso's[68] case the bladder contained 2½ liters of urine, and formed a large sac in the abdominal cavity. Polyhydramnios was present, and it was necessary to open the abdomen of the fœtus to deliver the child. The bladder may also be dilated with chronic hypertrophy, and hydronephrosis is occasionally seen with hydrocephalus or disease of the heart.

Disease of the Fœtal Genital Organs.—In cases where other organs are extensively malformed, the uterus may be prolapsed. Ballantyne, MacDonald, and McVicar report cases. Prolapse of the uterus is usually accompanied by spina bifida of the lumbar sacral region. Imperforate rectum may also be present.

Disease of the Fœtal Nervous System.— Internal hydrocephalus, spastic rigidity of the muscles, chorea, and ataxia have all been observed in the fœtus. In chorea there is often a history of abnormal pregnancy, the mother in some cases having had chorea or there being a family history of alcoholism or epilepsy.

Fœtal Fractures.—The fœtus is occasionally born with deformity in the bones following intrauterine fracture. Linck[69] reports a case of an infant expelled in easy labor. It had over thirty fractures, recent and old, in the skeleton. Even a greater number is also reported. In these cases the skeleton had been exceedingly brittle. Sperling[70] believes that these cases antedate fœtal life, and are probably caused by lesions of the amnion during embryonal existence.

Wounds, Dislocations, and Amputations.—In the absence of a history of great violence to the mother, apparent fœtal wounds must be considered lesions of the skin, originating in some abnormalities of the amnion. Apparent dislocations of the fœtal joints, in the absence of a history of direct violence at birth, must be referred to congenital malformations in the joints themselves. Spontaneous amputations in utero have not been satisfactorily explained. They probably originate before the fœtus has developed, and during embryonal life from disease or adhesion of the amnion.

Disease of the Fœtal Annexa.—Among the most common affections of the placenta are placental hemorrhages, often called apoplexies. These may be either upon the fœtal or maternal surface of the placenta and at various depths in its surface.. They vary from a minute point to the size of a hen's egg or larger; they may be recent or old. Usually the blood comes from the maternal vessels, the clot compressing the villi with their vessels. They usually follow injury to the mother or renal or cardiac lesions in the mother, and occasionally fevers. Bacteria are often found in the clots. Satullo[71] and Caruso[72] believe that bacteria cause them. They may cause premature expulsion of the fœtus, or they may end fœtal life or interfere with its nutrition.

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[68] Fabriso: Annali di Obstetricia, No. 17, 1895.

[69] Linck: Archiv für Gynäkologie, p. 264, 1887.

[70] Sperling: Zeitschrift für Geburtshülfe und Gynäkologie, Band 24, p. 225, 1892.

The placenta is also the site of degeneration of a fibrous and fatty nature of unknown origin, pointing simply to the fact that the placenta has almost outlived the period of its functional life. The child usually does not suffer from this condition.

Abnormal Conditions of the Umbilical Cord.—The cord may be large and edematous, as in cases of hydramnios and fœtal maternal dropsy. It may be of excessive length and tightly twisted in a spiral throughout its entire length. A long cord, with abundant amniotic liquid, gives the fœtus ample opportunity to slip through coils of the cord, thus producing knots. Occasionally these are drawn so tightly as to interfere with the circulation. Coiling of the cord around the neck of the fœtus is not infrequently seen, and in an excessively long cord the coils may extend not only around the neck, but also about the shoulders and chest. Shortness of the umbilical cord has been observed. Before labor, coiling of the cord may be inferred when a murmur can be detected over the fœtus slower than the fœtal heart and more rapid than the pulse in the maternal aorta or the uterine bruit. At labor a cord tightly coiled or a short umbilical cord exposes the fœtus to danger of death by premature separation of the placenta, with resulting hemorrhage and asphyxia or by occlusion of the cord. The mother sometimes complains of sudden and violent pain following a severe kick or motion of the fœtus. This is caused by sudden occlusion of the cord by the descent of the child as labor begins. Nothing can be done to remove the fœtus from such danger except to deliver the head of the child as promptly as possible by forceps and immediately loosen the cord.

Hydramnios.—A greater quantity than two pints of amniotic liquid is usually considered polyhydramnios. It often accompanies diseased conditions of the fœtus or mother, and is sometimes concomitant with altered conditions of the amniotic liquid, in which this becomes white in color, opaque, or even like pus. During the mother's pregnancy rapidly developing hydramnios may cause intense distress through great increase in the size of the abdomen, with dyspnœa and considerable suffering. In other cases the mother is comparatively comfortable. The condition may develop early in pregnancy, but is usually seen in its greatest development at about the fifth month. It may be accompanied by diseased conditions in the mother and the digestive and circulatory organs. It is not uncommon in cases of twin pregnancy; rarely there is a history of injury to the mother. A recent case in the observation of the writer may be described as typical of this condition:

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[71] Satullo: Archiv di Ostetricia, No. 5, 1898.
[72] Caruso: Archiv di Ostetricia, No. 6, 1899.

Multipara, aged thirty-one, was sent to the Jefferson Hospital for the removal of a cystic tumor, and referred to the Maternity. The patient's father died of phthisis. She had had seven children; the first was delivered by forceps, the others spontaneously. During previous pregnancies her general health had been excellent; she had no nausea, and could do her housework during the entire time. During the present pregnancy her general health had been excessively poor. Early in pregnancy she had much nausea, and lately the abdomen had enlarged so rapidly that she could not lie down, and suffered greatly from dyspnœa. She menstruated last in October, and was five months advanced in pregnancy. The abdomen had been larger than normal throughout the entire pregnancy, but distension had been especially rapid for the last six or eight weeks. Urine: deep amber, specific gravity 1,028; acid; urea, 1.8 per cent.; no microscopical debris. Blood: red blood-cells, 4,900,000; white cells, 4,800; hemoglobin, 65 per cent.; color index, 68.

On examination, the abdomen was uniformly enlarged, the distension being so great as to embarrass respiration seriously. Over the center of the abdomen dulness was heard upon percussion, with moderate tympany over the transverse, ascending and descending colon. No fœtal parts could be felt by palpation, nor could heart sounds be heard. The thoracic organs were normal, with the exception of a few râles over the bronchial tubes and a disturbed action of the heart. Upon vaginal examination, the pelvic floor was elastic and the cervix had been lacerated in former labors. The finger could be readily carried through the cervix and against the membranes, which were not tense. A body giving the sensation of a small fœtal head dropped against the finger upon introduction, and ballottement could be very distinctly obtained with an appreciable interval of time between the first and second impact of the presenting part. A diagnosis of rapidly increasing polyhydramnios was made, and the patient readily agreed to the termination of pregnancy.

The patient was antiseptically prepared for operation, and the membranes were ruptured at 12.40 P. M. on the following day. About two gallons of fluid were allowed to escape gradually, when the presenting part was allowed to come against the cervix to check the flow of fluid. Compression was made over the abdomen during the removal of the fluid, and a many-tailed abdominal binder was afterward applied. Labor pains soon followed the removal of the fluid; at about 3 o'clock a male child was expelled, and ten minutes later a second male fœtus within its amniotic sac. There was one chorion, but two amnions. Both cords were attached to the same placenta, which was abnormally large, very thick and with its tissues in a condition of apparent coagulation. The cord of the first child born was remarkable for large and tortuous veins, while its jelly was granular in appearance, with areas of cystic degeneration. This cord had a lateral attachment to the placenta, 20 centimetres distant from the attachment of the other cord. The entire specimen was at once sent to the pathological laboratory of the Jefferson College, where complete examination of the specimen was made, as follows:

PATHOLOGICAL REPORT.—Placenta and two male fœtuses.

There is a single ovoidal placenta which, when spread out, measures 29 x 18 cm. The end to which the larger fœtus is attached is somewhat the larger; the cord of the larger fœtus possesses a marginal attachment; that of the smaller fœtus is 2 cm. from the free margin of the placenta. The placenta on the side of the larger fœtus has a maximum thickness of 2 cm., and is, on the whole, thicker, as well as larger, than the opposite end.

The amnion surrounding the larger fœtus is evidently much thickened and quite opaque. The opacity is not uniform, but at no point is the membrane so clear or thin as the amnion covering the smaller fœtus. While the membrane is, as a whole, thicker and more opaque, the opacity shows a notable intensification in two ways: (1) There is a mottling or flecking formed by rather whitish or grayish white dots, for the most part 2 to 5 mm. in diameter, although a few are larger. These dots are quite opaque in their centres, but at the margins fade off more or less gradually to the opacity of the remainder of the membrane. (2) In addition to the flecked opacity, there is an equally marked, though less abundant, striation by rather regular bands that interlace in different directions, forming a sort of network. These bands vary in width from 1 to 4 or 5 mm. Many of these bands run in a more or less tortuous manner, and at the ends either gradually thinned and were lost or split into branches that united with other similar branches or merged into the membrane.

The amnion of the smaller fœtus showed nothing noteworthy.

The larger fœtus, the amniotic sac of which is abnormal, measures 3 cm. in length, and weighs 550 gm. The umbilical cord is 29 cm. in length, irregular in its contour, being bossed or tuberous as a result of lateral sacculations. The jelly is unusually translucent, and the contained vessels can be seen throughout the major part of the cord. The vessels are dark, extremely tortuous and irregularly dilated.

The cord is much thicker than the cord of the other fœtus, possessing a transverse diameter that varies between 1 and 2 cm.

The smaller fœtus is 27 cm. in length, and weighs 395 gm. It is very much more cyanosed than the other; the cord possesses a maximum transverse diameter of 0.6 cm. There is very little twisting of the cord, and it seems flat. It is not nearly so translucent as the other, and the vessels are not tortuous.

Both fœtuses were examined with care, but no visceral abnormality could be detected. The serous cavities of the larger fetus contained possibly a little more fluid than normal, certainly more than the same cavities in the smaller fœtus, and there was a suggestion of subcutaneous edema, but it was not marked. A careful examination failed to disclose any gross lesion involving the vascular system of either fœtus.

Blocks from a number of points in the placenta, parts of both cords and both amnions were fixed in Bensley's solution, washed in water, dehydrated, infiltrated, sectioned and the sections stained by approved laboratory methods.

Histology.—Cord of the smaller fœtus on transverse section was at some points but a thin band, in other sections ovoidal, and in still others stellate, having three points, in each of which was a vessel; the star-like points were rounded and measured from 1.5 to 2 mm. in width.

Microscopically, the cord was surrounded completely by the layers of the amnion. The ectodermal cells were very distinct and clear, and several layers were present. The basement layer consisted of small cuboidal cells that took the stain more deeply than those of the upper layers. The cells of the upper layers were comparatively large and polygonal in shape. The nuclei in all stained well, and were large and prominent. The tissue immediately beneath the cells was denser than that nearer the centre. Just beneath this dense layer were small masses that took the eosin quite deeply. These formed an irregular area almost around the cord. They were apparently bundles of fibrous connective tissue extending longitudinally. No nuclei were visible in these areas.

The middle of the cord consisted of both embryonic and fully developed connective tissue. The latter seemed to predominate and was prominent, especially in the neighborhood of the vessels. Between these and the periphery the cells were more stellate in type, though not of the youngest form. The intercellular spaces were almost entirely filled with a hyaline, faintly acidophilic substance quite free from granules.

The vessels were well developed. The umbilical vein and one artery contained clotted blood. The other artery was free from cells. The stromal tissue was condensed around the periphery of the vessels, forming an adventitia. The cells of this tissue were spindle-shaped. The involuntary muscle fibers of the media were well developed; in one part of the arteries the media was clearly in excess. In this vessel the intima was greatly thickened, the thickening being more conspicuous on one side than the other, leading to the appearance of nodular thickening of the structure. The extra laminæ were of coarsely fibrillated tissue, containing but few cellular elements. Stains for elastica yielded no satisfactory reaction. The wall of the vein did not show, in any of the sections examined, any noteworthy abnormality.

Besides these openings, a fourth was noted. This was slit-like—on transverse section resembling an exclamation point—situated midway between the two arteries, and had neither muscular nor adventitial coat, although the surrounding tissue was somewhat condensed. The lining consisted of two or three layers of squamous cells. This opening was not present in all sections, and apparently occurs here and there in the cord, and is not a continuous cavity.

Cord of the larger fœtus: After fixation, this cord at the point sectioned was 1 cm. in its long diameter and 0.8 cm. in the other. The ectodermal cells covering the cord were flatter, smaller, and less distinct than in the previous cord, and the stromal tissue not far advanced in development. There was little fully developed connective tissue, even in the region of the vessels. Neither was there an adventitia, as in the above cord. The stellate cells were large and quite numerous, and possessed many processes; and, although there was considerable intercellular substance, the intercellular spaces were numerous and quite large. They were especially well marked toward the periphery. The stellate cells seemed to be younger than those of the previous section. On the whole, the appearance outside of the vessels was very much like an irregular network. Some spaces were exceedingly large, and appeared as though they might have been distended by some fluid, the picture being that of an extremely edematous myxomatous tissue.

One artery and the vein showed no abnormality. The remaining artery showed a notable thickening of the intima, nodular in character, similar to, but more marked than, that already described in the other cord. Near to the abnormal artery and between this structure and the vein was a small group of cells, apparently identical with those covering the cord; the outer cells of this group were somewhat flattened and concentrically arranged, while those occupying the centre were irregularly grouped. The appearance was suggestive of that resulting from incomplete closure of a canal.

The amnion of the larger fœtus was opaque and unusually thick. Microscopically, on surface view, it showed thick bands of tissue running in various directions. These bands were quite dense, and contained many rod-shaped and oval nuclei, many of these resembling those of nonstriated muscle fibre. They were not noticed in slides of the normal amnion. Between these bands the spaces were filled with cells large and small that took the stain fairly well. These cells varied considerably in size, and showed a granular protoplasm. They were projected upon the bands also. The tissue between the cells took the stains lightly, and seemed finely granular and nearly homogeneous.

Upon section the membrane showed a covering of large, irregular cells (ectodermal), arranged in several layers. At some points but two layers of these cells were present, while in other areas irregularly-piled cells without lamination were grouped on the surface of the membrane. From their grouping and number it is reasonable to assume that the flecking observed in the gross specimen was due to the accumulation of cells here mentioned. The nuclei of these cells showed prominently, and the protoplasm stained but faintly. The nuclei were granular, and were no doubt the structures described as cells in the description of the surface view of the amnion. The cell margin was not clearly visible, either on surface view or on section. The tissue beneath appeared easily separable into layers, and in these the nuclei were abundant and prominent; they were rod-shaped, oval, or round. In the bands already referred to the resemblance to involuntary muscle fibres was pronounced. The specimens studied seemed to be chiefly sections of the dense bands. On the side opposite to the ectodermal cells was noted a single layer of flat squamous cells. The nuclei were darkly stained and distinct, slender, and, on section, rod-shaped in structure. They were smaller than the nuclei in the middle part of the membrane.

The placenta was, for the most part, apparently normal. Sections from a number of points showed no abnormality, except that on the fœtal surface there was a massing of cells, quite like that described as present on the cord. In the superficial part of the chorion above the villi one occasionally observed groups of lymphoid cells, sometimes alone and at other points mixed with larger cell elements, resembling those of the syncytium. Some of the arteries near the area of cord implantation showed obliterate changes similar to those already described as present in the diseased trunks. The villi were well developed, and the intervillous spaces filled with blood. The cells covering the villi, as well as the villous matrix, were apparently normal.

The mother made an uninterrupted recovery.

The pathology of hydramnios still awaits complete explanation. The old statement of Guillemet,[73] that hydramnios has no pathological anatomy, is largely true. No constant changes attend this condition. The placenta may be larger than usual, boggy, dropsical, and infiltrated. In case two the vasa propria beneath the amnion were distinctly enlarged, to which attention has been called by Jungbluth.[74] The amnion and chorion may be thickened or may not be altered. Viti[75] found the epithelial layer of the amnion intersected by large fissures, and subepithelial fibres freely exposed, the protoplasm of the cells granulated, with fatty degeneration. He experimented upon the passage of fluids through the arteries and veins into the placenta by injecting different fluids, and found that seven times the quantity of fluid escaped through the veins that escaped through the arteries. Any fœtal condition causing venous engorgement tends to produce polyhydramnios, and this condition, so far as the fœtus is concerned, has been likened to the dropsy of adult life, caused by disease of the heart or liver. In some cases the formation of irritating (lymphagogue) substances causes polyhydramnois, as shown by Opitz.[76]

A natural theory has been that the liquor amnii is fœtal urine, and that polyhydramnios indicates increased renal action; but in some cases the kidneys show no lesions, the urethra may be occluded or absent, and even the kidneys may be absent and still polyhydramnios be present. Bar[77] has well stated the older theories, none of which explain all of the phenomena present. One of the writer's cases illustrates one theory for polyhydramnios, that the fluid is an excessive secretion from the cerebrospinal canal of the fœtus. In this case the open canal and meningocele gave strength to this supposition. Where polyhydramnios follows a blow or fall, flaky deposits are sometimes seen on the surface of the amnion, and have been supposed to result from the traumatism preceding labor. It seems reasonable to suppose that lymph can pass freely through the stomata of the amnion. In twins, one fœtal sac may contain excessive fluid, while the other does not, as was seen in the case described.

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[73] Thèse Paris, 1876.

[74] Archiv für Gynäkologie, Band 4, page 554, 1872.

[75] Bull. de Soc. tra. i cult. d. se. med. in Siena, III, 196-200, 225 222, 1885.

[76] Centralblatt für Gynäkologie, p. 555, 1898.

While we may not explain adequately by one theory the occurrence of polyhydramnios, we may remember, as Ballantyne[78] has stated, that the relative conditions existing in polyhydramnios are those normally occurring in early fœtal life. At the fourth month of gestation the amniotic liquid weighs more than the fœtus or the placenta and membranes. Through conditions which affect embryonal and fœtal development, this early relationship between the fœtus and its hydrosphere continues after the fifth month. It is observed clinically that acute polyhydramnios begins at about the fifth month of gestation.

We may look to pathological chemistry for further knowledge upon this subject. By cryoscopy Resinelli[79] has investigated the osmotic pressure of the maternal and fœtal blood and of the liquor amnii by taking the differential of their freezing-points. This pressure is less in the maternal and fœtal blood at birth than in the non-pregnant adult, and it is constantly less in the liquor amnii than in the maternal or fœtal blood. In twin pregnancies the freezing-point of the liquor amnii of one fœtus may differ from that of the other. Polyhydramnios is one of many conditions for which bacteriology presents no solution, but which requires increased knowledge of physiological and pathological chemistry.

The diagnosis of polyhydramnios is important and at times difficult. If the amniotic liquid is accumulating but slowly, haste is not imperative, and in mild cases it may not be necessary to interfere; but if the fluid is increasing rapidly and the patient's general health and comfort are suffering, pregnancy must terminate. The diagnosis of pregnancy is made difficult by the fact that fœtal heart-sounds cannot be appreciated in advanced cases, nor can the body of the fœtus be felt. Pregnancy must be diagnosticated by the changes in the mammary glands, and from the history rather than from the usual and positive signs of gestation.

The differential diagnosis between polyhydramnios and abdominal dropsy may be made as follows: In abdominal dropsy the abdomen is flattened and distended laterally, its dull area changing with the position of the patient. There is no evidence of intermittent uterine contractions, which can often be elicited in cases of polyhydramnios. In abdominal dropsy there is often some cause, as disease of the heart or liver or kidneys, to account for the effusion.

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[77] Thèse Paris. 1881.

[78] Manual of Antenatal Pathology, 1902.

[79] Annali di Ostetrica e Ginecologia, No. 23, p. 1029, 1901.

The differential diagnosis between ectopic gestation and polyhydramnios is made by the excessive distention which is not present in ectopic gestation, by the absence of the characteristic pain and shock which are observed in ectopic gestation, and by the history of the case. It must, however, be remembered that ectopic gestation may be complicated by polyhydramnios in its early stages.

In the case of an ovarian cyst there is usually a history of longer illness, the swelling having been unilateral at first. The intermittent hardening in the abdominal tumor is absent, and careful bimanual examination reveals the uterus but little enlarged at one side of the tumor. Encysted dropsy or localized tubercular peritonitis might be impossible of differential diagnosis from polyhydramnios.

When the fact of pregnancy is made out, there comes the second diagnosis between pregnancy and polyhydramnios, or pregnancy and ascites, ovarian cyst, plural pregnancy, an hydatid mole, a very large child, or a malformed fœtus. In the hydatid mole, the pear-shaped uterus has little fluctuation, and there is a history of repeated discharge of blood. In the presence of a large fœtus or large and malformed fœtus the heart can usually be found, fluctuation and ballottement are absent, and careful palpation will reveal the child. Palpation and auscultation will usually give warning of twin pregnancy, and yet, after the most careful examination, twin pregnancy may be mistaken for polyhydramnios, or the contrary be true. When an ovarian cyst complicates pregnancy, it will be difficult to outline two tumors, and sometimes a positive diagnosis cannot be made. Ectopic gestation must always be kept in mind as a complicating element in these cases.

When polyhydramnios is associated with twin pregnancy, or with acites or with an ovarian cyst, or occurs in an ectopic gestation sac, it is often impossible to make a positive diagnosis. When labor begins and the cervix dilates, a diagnosis may be established.

In these and other cases two points have been noticed which are anomalous and without satisfactory explanation. One would naturally expect in the presence of a large quantity of amniotic liquid that the tension of the liquid within the bag of waters would be considerably increased, and that the membranes would feel tense when the finger was placed against them. We have not found this to be the case, but, on the contrary, that the membranes remain relaxed and that the amniotic liquid had apparently very little tension, although the quantity of fluid might be large. Under these conditions, one would also expect shortening of the cervix and premature obliteration of the cervix; on the contrary, in our observation this does not occur until active labor actually begins. These conditions are misleading, and sometimes throw doubt upon the diagnosis.

The treatment of polyhydramnios by the administration of drugs is without known value.

When the quantity of fluid is but slightly in excess and is not increasing rapidly, and the patient's general health remains good, the condition need not be interrupted. In the presence of rapidly increasing distention, with large quantity of fluid and interference with the patient's general condition, pregnancy must be terminated. This must be done under thorough antisepsis by dilating the cervix sufficiently to introduce the finger, by puncturing the membranes and allowing a portion of the contained fluid to escape. In allowing fluid to escape, care must be taken to use the fœtus as a valve, preventing the immediate removal of the fluid. It is usually unnecessary to employ an anæsthetic for the rupture of the membranes. The patient is put in an available position, one or two fingers inserted within the cervix, and the membranes are separated from the wall of the uterus as far as possible. Under the guidance of the finger, a pair of closed uterine dressing forceps is gently thrust into the sac and the blades opened sufficiently to permit the introduction of the finger. A portion of the fluid is allowed to escape gradually, the finger acting as a plug until the operator feels the presenting part closing firmly down against the cervix. Then the finger is removed and the amniotic liquid allowed to drain very slowly. The maintenance of firm pressure over the abdomen is most valuable in these cases. Not only is the uterus made to contract, but the patient is saved the severe shock which is often seen when a large body is removed from the abdomen suddenly. Pressure may be applied by a many-tailed abdominal binder, pinned securely, or during the escape of the fluid by a bandage placed across the abdomen and drawn inward by two assistants. With the latter, pressure can be varied in accordance with the needs of the case. After a part of the fluid has been removed, the patient must be kept under immediate observation. The uterus often acts suddenly in these cases, labor may be precipitate, followed by relaxation and hemorrhage. Abnormal presentations are not infrequent. No effort should be made to hasten labor in the interests of the child, because the fœtus is so often deformed and non-viable that the mother should be exposed to no risk on its account. The placenta may separate suddenly at the latter part of labor, or may require manual removal. After the child is expelled, the uterus must be prevented from relaxing by manual compression, massage, the complete removal of the placenta and membranes, irrigation with hot antiseptic fluid, tamponing with gauze, and the hypodermic use of strychnine, ergot, and other stimulants, if necessary.

When a positive diagnosis cannot be made, abdominal section is justifiable to complete a diagnosis and to deal with any condition requiring removal. The uterus should not be evacuated. In a case reported by Skirving[80] the abdomen was opened on a mistaken diagnosis of ovarian cyst and the condition found to be polyhydramnios. The abdomen was closed, the amniotic liquid slowly disappeared, and the patient went to full term and was normally delivered of a healthy, well-formed child. Such a case indicates the possibility of absorption of the excessive quantity of liquid.

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[80] Edinburgh Hospital Reports, vi, 387, 1900.

Although polyhydramnios itself is non-malignant, it has a considerable mortality rate, which is not definitely stated. Excessive distention of the uterus predisposes to relaxation and hemorrhage. Even if the fœtus be not malformed, it may assume an unnatural position and presentation upon the escape of the fluid, and be exposed to unusual danger. The mother may develop sudden shock when the fluid is evacuated, and death from cardiac syncope may occur soon after labor. The deterioration in the patient's general health, which usually accompanies this condition, makes her more than usually susceptible to puerperal septic infection. There is every reason for thorough, prompt, and skilful treatment of these cases.

Oligohydramnion.—Oligohydramnion describes a lessened quantity or absence of amniotic liquid. It is less common than hydramnios, and usually accompanied by the same abnormalities and malformations of the fœtus. Abnormalities of the urinary organs, with extensive malformations, have been reported with this condition. Ankylosis of the joints and amniotic bands are also observed in this condition. The placenta is often thick and irregular in form, with yellow or gray patches and caseous nodules, and sclerosis of fœtal and maternal structures has been found.

The Death of the Fœtus.—The most usual cause of fœtal death is asphyxia. This may be brought about through mechanical interruption of the placental circulation or through the gradual obliteration of the placental circulation through disease. Toxines passing from mother to child may so interfere with the oxygenating action of the placenta as to cause death by asphyxia. Fœtal asphyxia may be brought about gradually or rapidly. In the first instance the placenta is very gradually destroyed, its functions becoming slowly interrupted, while in the latter instance a sudden and more or less complete interruption of the circulation of the fœtus and placenta takes place. In rapid fœtal asphyxia the pulse-rate is slowed by the irritation which carbondioxide exerts upon the pneumogastric nerve. The respiratory centres are irritated, involuntary efforts at respiration are made, and the liquor amnii is drawn into the lungs, whose circulation gradually fails, and the general circulation gradually ceases. In the slower form of asyphyxia carbondioxide accumulates so gradually as to act as an anæsthetic, and involuntarily movements of respiration do not occur. In the rapid form of asphyxia, if the interruption to the placental circulation be removed, although the heart has ceased to beat, it may again commence its action. Experience shows that it is easier to bring about the resumption of cardiac action when the fœtus is within the uterus than to cause the heart to beat in a fœtus born apparently dead. When the fœtus dies of asphyxia, the blood is dark in color, there are extravasations of blood beneath the pleura and pericardium, and often amniotic liquid and meconium are found in the air passages. Rigor mortis usually appears also.

Fœtal Rigor Mortis.—Numerous observers have reported the occurrence of rigor mortis in the fœtus. In some of these cases Cæsarian section was performed, and the fœtus found dead and rigid within the womb. Some complications existed in labor with these patients, and the death of the fœtus resulted from this condition. Rigidity was well marked in most of these cases, the limbs and jaws and neck being stiffened. It disappeared in from one hour to thirty after delivery, and post-mortem examination did not reveal it. Experiment upon animals shows that there is no good reason why this phenomena should not occur.

The Diagnosis of Fœtal Death.—This difficult point in obstetric diagnosis has been studied by Ballantyne. He states the diagnostic points essentially as follows:

MAMMARY GLANDS.—When the fœtus dies, the immediate effect upon the mother's breasts is the same as that of birth, swelling and tenderness, with engorgement of the veins and secretion of chlostrum and milk. This ceases in a few days, the glands becoming quiescent. When the dead fœtus is expelled from the womb, the breasts do not enlarge and milk does not form, as after a normal labor. Tridondani[81] draws especial attention to the value of changes in the breasts, and believes that examination of breast milk in these cases would show altered conditions following fœtal death.

EXAMINATION OF THE MOTHER'S ABDOMEN.—The changes in the abdominal tumor of pregnancy are very characteristic. The womb becomes flabby, sinking into the pelvis and bulging at the sides, resembling dropsy. The umbilicus does not protrude, muscular contractions of the womb cease, the pigment often partially disappears from the abdomen, the bloodvessels in the abdominal wall grow smaller, and the discoloration of the birth-canal gradually ceases. The fœtus is indistinct to palpation, the head becoming softened and much less firm, and in many cases the head ceases to present. Fœtal movements cease, and the fœtal heart cannot be heard. The bruit in the placenta and uterus ceases shortly after fœtal death. If putrefaction occurs, the womb becomes distended with gas, and tympany is heard over the uterus.

VAGINAL EXAMINATION.—Although less valuable than examination of the abdomen, vaginal examination gives signs of diagnostic value. Some time after the death of the fœtus the cervix is not softened, the vaginal arteries do not pulsate, and it is often difficult to distinguish the presenting part. A dirty brownish or blood-stained fluid is often discharged from the uterus. Reifferscheid[82] reports a case in which the membranes ruptured while the fœtus lived. The fœtus escaped from the amniotic sac, and continued to develop outside the membranes.

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[81] Tridondani: Annali di Ostetricia, No. 21, p. 71, 1899.

[82] Reifferscheid: Centralblatt für Gynäkologie, No. 25, 1901.

CHANGES IN THE MOTHER'S CONDITION.—If the mother has suffered from the occurrence of pathological conditions, due to pregnancy, these gradually cease. If the urine has shown that the kidneys were overburdened, this condition passes away, persistent nausea ceases, dyspnœa is lessened, varicose veins and swelling of the limbs grow less.

THE MATERNAL EXCRETIONS.—The urine of the mother undoubtedly increases in quantity. Vicarelli[83] considers the presence of acetone as a sign of fœtal death. The value of acetone as a sign of fœtal death is as yet undetermined, and its presence is often associated with syphilis, with eclampsia and especially long and difficult parturition. Peptonuria indicates involution of the muscular tissue of the womb, and so may in a measure indicate fœtal death. When putrefaction occurs, the signs of septic absorption may complicate the diagnosis of the death of the fœtus.

Diagnosis During Labor.—When twins are present or the gestation is extrauterine, it may be practically impossible to arrive at an accurate diagnosis of fœtal death. During labor, if the fœtus is dead, the presenting part is softened, the cranial bones are easily indented or pushed aside, the amniotic liquid contains meconium and epidermis, and the fœtus shows signs of maceration.

The Morbid Anatomy of Fœtal Death.—When the fœtus dies, it is usually expelled within a short time after its death, or is retained for about fourteen days. During this time maceration occurs, and the fœtus is expelled. Cases of prolonged fœtal retention are usually those of ectopic gestation, rather than long retention of the fœtus within the womb. Maceration is an aseptic softening of the fœtus, in whose first stage the epidermis is raised into blebs filled with bloody serum, while serum collects in the cavities of the body; the organs are softened, and the subcutaneous tissue is infiltrated with serum. In the second stage, after the tenth day, the fœtus is swollen but softened, the abdomen and head flattened, the epidermis has largely disappeared, leaving the dull red skin beneath fully exposed. The scalp is infiltrated, and the cranial bones move freely over each other. The entire body is filled with a bloody serum, and the organs are very much softened. The coloring matter of the blood is dissolved, and the histological elements of tissues cannot be recognized. Should the fœtus be retained as long as the fortieth day after death, it becomes completely softened, its organs being practically unrecognizable. In rare cases, where the fœtus is retained within the womb longer than two months, the soft parts disappear, and the skeleton and connective tissues are gradually expelled in pieces.

Changes in the Placenta and Cord After Fœtal Death.—Owing to its intimate connection with the mother, the placenta may show almost no change after the death of the fœtus. In some instances a considerable part of the placenta is converted into fibrous tissue, with functional destruction of the villi. The cord becomes gelatinous, the membranes lose their clearness, the Wharton's jelly either diminishes or increases. It is, however, quite possible that many of these changes precede fœtal death, originating from the same cause, which brings about the death of the fœtus.

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[83] Vicarelli: Prager med. Wochen. 1880-93.
Rev. di. stet. Vol. II. 1897.

Mummification.—By mummification is meant the peculiar drying of the fœtus, occurring in early fœtal death, with absence of amniotic liquid and the gradual toughening of the fœtal tissues. When twin pregnancy is present, one fœtus may continue to live after the death of the other, the dead fœtus being compressed by the living child.

Fœtal Death in Ectopic Gestation.—In addition to maceration and drying of the fœtus in ectopic gestation, the fœtus is so situated that bacteria may readily gain access to its sac and putrefaction may occur. In other cases saponification takes place or calcification, with the formation of lithopædion.

The Treatment of Fœtal Development. **Diet.**—In addition to the usual precautions known as the hygiene of pregnancy, the question of influencing the size and development of the fœtus through the diet of the mother has occasioned much research. Abundant evidence exists to show that excessive feeding produces a fœtus of unusual size and weight. Diminution in the mother's food is not followed by corresponding diminution in the size of the fœtus, because the fœtus is a parasite and persists in thriving at the expense of the mother. Prochownick[84] and others have produced different results upon mother and child by modifying the diet of the mother. In forty-eight cases, representing sixty-two confinements, where it was desired to reduce the size of the fœtus because of contraction of the pelvis, the diet was limited as follows: Breakfast—a small cup of coffee, biscuit or bread with butter; dinner—meat, egg, fish, green vegetables prepared in fat, salad, cheese; supper—same as dinner, with bread and butter. Water, soups, potatoes, puddings, sugar, and beer were excluded. A limited amount of light wine was taken. If the patient desired, small quantities of milk and water were substituted for alcohol, with fresh fruit. A small cup of tea or coffee was allowed in the afternoon, with a little bread and one egg. The total quantity of fluid taken was not to exceed 500 cc. This method of limiting the size of the fœtus by the diet of the mother is the result of the most thorough investigation which has yet occurred in the subject, and is deserving of attention.

The Treatment of Diseases of the Placenta.—Chlorate of potassium has long been given in cases of repeated fœtal death from placental disease. It is often combined with some form of iron. Lomer[85] obtained good results with iodide of potassium and iron in these cases.

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[84] Prochownick: Centralblatt für Gynäkologie, No. 13, 1899.
Therapeutisch monat. 15, Heft 8 and 9, 1901.

[85] Lomer: Zeitschrift für Geburtshülfe und Gynäkologie, Band 46, p. 306, 1901.

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[s1] **Tridondani**: Annali di Ostetricia. No. 21, p. 71, 1899.

[s2] **Reifferscheid**: Centralblatt für Gynäkologie. No. 25, 1901.

The Treatment of Fœtal Disorders of the Blood.—In thyroid extract we have a remedy promising well in cases where children have been lost by bleeding in repeated pregnancies. Ballantyne obtained good results with chloride of calcium and arseniate of iron with strychnia in a case of this sort.

CHAPTER VIII.

ABNORMALITIES IN THE SIZE AND FORM OF THE FŒTUS: MONSTROSITIES.

Abnormally Large and Small Children.—Variations in size, without abnormalities in form, have been noted in the cases of children born of excessively large or very small parents. Children weighing more than twenty pounds have been observed, although very rarely. It is very seldom that the obstetrician will meet with a fœtus weighing more than ten pounds, while the cases in which the fœtus exceeds the average in weight are by no means uncommon. Dwarf children are occasionally observed who are perfect in form, but of diminutive size. They present no other abnormality, except a feebleness in strength and often a deficiency in nervous force.

The causes which lead to the birth of excessively large or abnormally small children must be sought, first of all, in the stature and development of the parents. Large children are born of large parents, while occasionally it is observed that parents of average stature may have a child so deficient in size as to be practically a dwarf. No cause is found in most of these cases for the small size of the offspring.

It is a matter of common observation that male children usually resemble more the mother than the father in physical and mental characteristics, and that female children more frequently resemble the father.

Increase in Fœtal Size in Repeated Pregnancy.—The obstetrician will often have occasion to notice the progressive increase in the size of the fœtus in repeated pregnancy. In estimating the prognosis of labor, this factor must be taken into account. If, on inquiry, it is found that preceding labors have been difficult because the child was above the average size, there is every reason to expect in subsequent labor a similar complication. When palpation reveals the existence of a large fœtus at the full period of viability, it is better to induce labor than to expose the patient to the risks of another difficult labor with a very large child. In many of these cases it is found that excessive appetite on the part of the mother during pregnancy is followed by corresponding development on the part of the fœtus. The belief has long been current that a diet rich in meat, and especially in beef and in articles of food containing earthy salts, produces very large children. In cases of excessive appetite on the part of the mother, or where she has already borne very large children, it is well to limit her food by the exclusion of the heavier meats by substituting milk, fruit, and bread for other less easily digested food. It is quite possible to nourish such a patient well, and at the same time to avoid the dangers and inconveniences arising from the excessive size of the fœtus attendant upon an abnormal consumption of the heavier foods. Prochownick's diet may be tried in cases where it is desired to lessen the size of the fœtus. (See page 117.)

Estimation of Fœtal Size.—In estimating the size of the fœtus before birth, palpation is the most practical method available. The length of the fœtus may also be measured through the abdominal wall, or by introducing one pole of the pelvimeter within the cervix, while the other is over the fundus of the uterus. In estimating the size of the fœtal head care must be taken that the presence of fœtal intrauterine disease, such as rhachitis, does not mislead the examiner. A rhachitic skull within the uterus may be mistaken for the head of an abnormally large child. A hydrocephalic skull may also occasion error in diagnosis.

Ascertaining the Contour of the Fœtal Cranium.—In making a prognosis as to the course and mechanism of labor it would be of advantage to the obstetrician could he foretell something regarding the shape of the fœtal cranium. If either or both of the parents present marked abnormality in this respect, it is reasonable to suppose that the shape of the fœtus may be modified by this circumstance. Marked peculiarities in the contour of the head in grandparents have also been reproduced in the fœtus. While cases of this sort have been observed, still the number is not sufficiently great, nor can the relation of cause and effect be traced sufficiently clearly to enable the obstetrician to foretell the shape and contour of the fœtal skull. The perfection of diagnosis by the Röntgen rays should place at our disposal valuable means of ascertaining the contour of the fœtal cranium. We are at present limited to palpation and combined internal and external palpation, with the use of anæsthesia if necessary.

MALFORMATIONS: MONSTROSITIES.

Several causes working independently or together may produce malformations in the fœtus. The causes of this condition have been studied not only by observation upon the human being, but also by experiment upon other organisms. It is most natural to suppose that abnormalities in the elements which form the embryo, or in their manner of union, may produce such a result. The ova of certain female fish have been found to be especially apt to produce malformed young without reference to the source of impregnation. It has also been observed that certain women have repeatedly given birth to monstrosities. Experimental and clinical observation seem to show that the ova are responsible for these conditions.

Mechanical Disturbance and Mutilation of the Ovum.—From the study of the manner in which the ovum undergoes division, it is evident that mechanical impressions may greatly alter the course of development in the embryo. The position or equilibrium of the ovum may be altered or direct violence may be done. Experiment has shown that if the egg be inverted so that its germinal portion is placed in an abnormal position, a malformation will result. If eggs are subjected to similar treatment during incubation, chicks so born show distinct evidences of the abnormal position of the egg. It is curious to observe that the largest portion of the chick is that developing from that portion of the ovum which was lowest in the egg. Partial inversion of the viscera has been caused by keeping the germinal area beneath the yolk.

Violent disturbance of the impregnated egg has also caused the formation of monsters. This has been repeatedly proved by observing eggs which have been subjected to violence in transit, or which were purposely rotated during the process of incubation.

Direct mutilation of the ovum has resulted in the production of marked abnormalities in the development of the embryo. Injuries to the amnion, by direct violence or the application of the cautery, have been partially successful in producing monsters. For the perfect development of the fœtus it has been found that a temperature of from 41° to 42° C. is requisite. When heat was lost, development was retarded, and was not resumed until the temperature was restored. Equally interesting are the results of experiments in preventing the entrance of oxygen into the egg by rendering the shell impervious. When this is done, variations in the shape and development of the fœtus are observed.

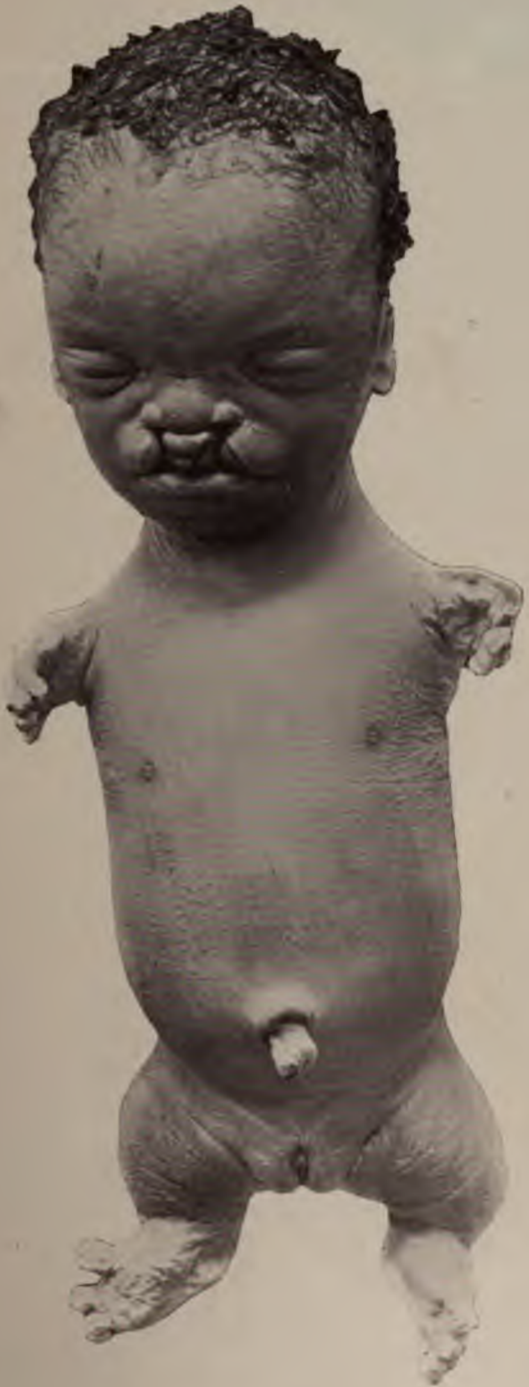
While no exact relation has been observed between the sort of interference practised with the ovum and the resulting type of abnormality or malformation, still the general principle remains established. From this experimental knowledge we can well understand how disturbances in the mother's economy, or radical changes in her environment, may react injuriously upon the development of the embryo. It naturally follows that to obtain the best development for the fœtus the mother must be undisturbed by either physical violence or nervous shock; that she should not be exposed to extremes of temperature, while an abundant supply of oxygen must be afforded her, and care be taken that nothing interferes with the mechanism of respiration.

Classification of Monstrosities.—In classifying abnormalities in the development of the human being Saint Hilaire's is adopted by the greater number of writers upon the subject. He places such abnormalities in one of four divisions:

Hemiteratic.
Heterotaxic.
Hermaphroditic.
Monstrous.

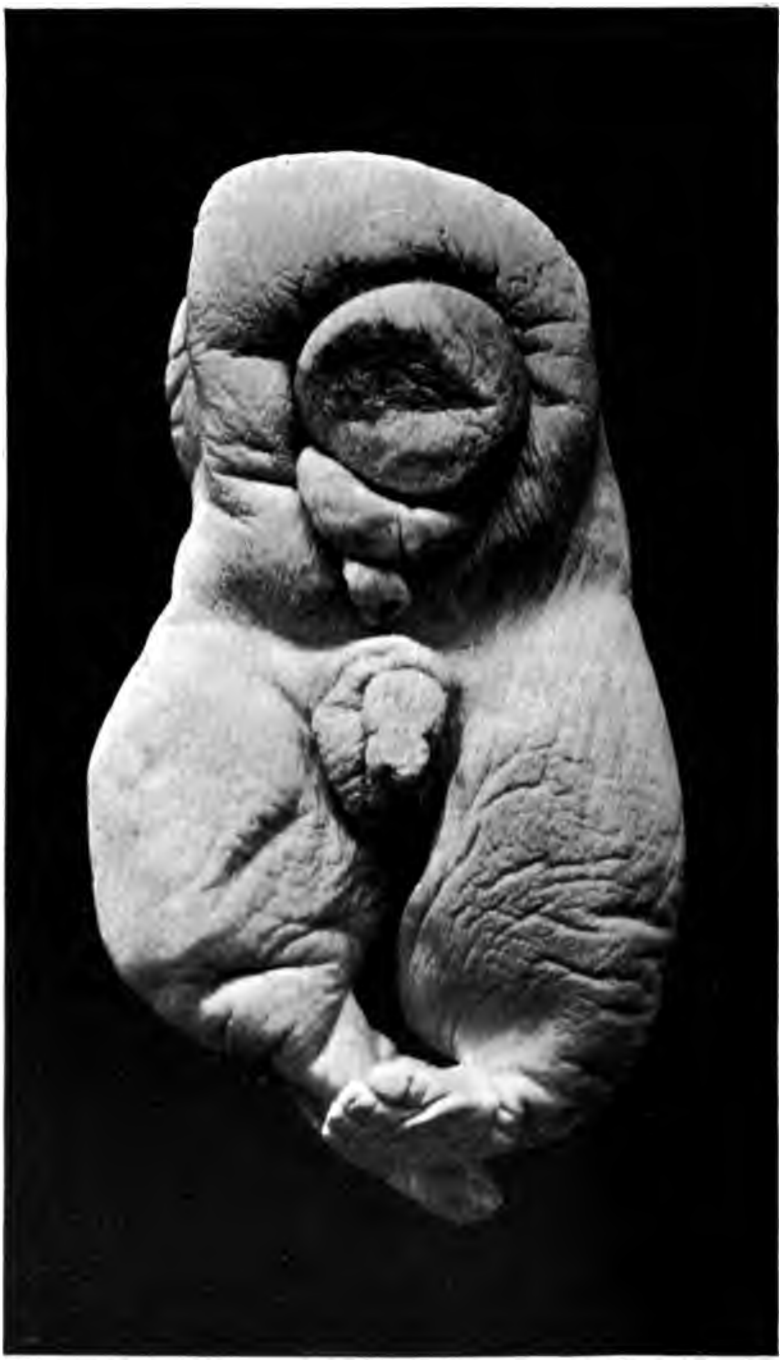
Hemiteratic. By hemiteratic are understood variations in volume,

PLATE V.



Phocomelus. (HIRST AND PIERSOL.)

PLATE VI.



Acephalus. (Hirst and Piersol.)

form, color, structure, position, number, and existence of the organs normally found in the body. It will be observed that while the fœtus may have the organs always found in the normal being, that these organs vary from the normal in some of the particulars mentioned. There will be present, however, in the individual no distinctly foreign arrangement of structural elements, sufficiently differing from normal to cause the individual to be considered as a monster. Literally speaking, the hemiteratic fœtus is remarkable for its close resemblance to the normal, while the monster may be so misshapen that it may be difficult to recognize the various organs of the body.

As examples not infrequently seen of this class of abnormality we have the dwarf, the giant, diminutive size of the breasts, or partial development of the vagina, or excessive size in the mammary glands, deformed pelves, albinism, lack of ossification in the skeleton, hernia or exstrophy of the bladder, abnormal occlusion of the rectum, vulva, or vagina, complete closure of the vagina, hare-lip, cleft palate, the absence of a kidney or of the womb, or the presence of double uterus, or of additional digits. In all of these, however, the individual is not so misshapen as to fail of recognition, while the various organs of the body are capable of identification.

Heterotaxic.—The heterotaxic fœtus shows, however, an abnormal arrangement of the various layers of germinal epithelium, which results in the transpositional abnormal arrangement of organs or groups of organs.

Hermaphroditic.—Under the head of hermaphrodite is designated a fœtus containing the reproductive organs of both sexes. While this condition is rarely perfect, still examples where each set of organs can be recognized are not uncommon.

Monsters.—Monsters are those examples of abnormal development which are so distorted as to present, in many cases, but little resemblance to the normal human being. They are either single or composite, as they are one distorted individual or the union of two.

AUTOSITIC.—Single monsters are again distinguished as those capable of independent existence, termed autositic, and those which depend upon another embryo for nourishment, which is received at the umbilicus through the umbilical and placental vessels. Among the autositic monsters are commonly seen those which have imperfect limbs. They are known as ectromelus. Another common variety of this deformity is found in those monsters whose lower limbs are twisted or united wholly or partially together. Such are termed symelus. Other autositic monsters are those in which the body is variously deformed, while a considerable class of such monsters show varying degrees of failure in development of the cranium, the brain, and the organs of the special senses. (Plate V.)

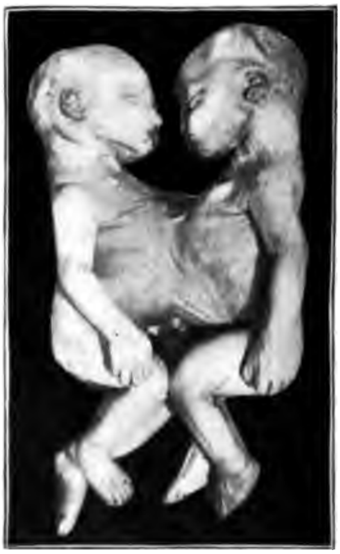
OMPHALOSITIC.—Omphalositic monsters show varying deformities of the head, the thoracic viscera, and the limbs, which make them incapable of living after the umbilical vessels are occluded. (Plate VI.)

Composite.—Composite monsters are formed by the union of two or more of the various sorts already described.

Conjoined Twins.—The most familiar example of this monstrosity was the well-known Siamese twins. More recently operation was performed upon twin girls by Doyen, and a connecting band successfully severed. The following case in the experience of the writer illustrates the fact that in most instances separation of conjoined twins is impossible:

The writer was called in consultation by Dr. J. H. Sargent, of Philadelphia, to examine conjoined twins, which Dr. Sargent had delivered. The mother was a primipara, aged twenty-six, and both she and her husband were normal in health. Labor came on a month prematurely and was begun by the rupture of the membranes. When dilatation was complete, the twins presented with the face of one turned toward the front, the chin beneath the pubes. The forceps was applied and the head of the larger twin brought down upon the perineum, and the forceps was removed and the head delivered. As the second child did not follow promptly, the attending physician brought down the feet of both, and still retaining his grasp upon the chin of the first child, delivered the children without great difficulty. There was evidence of life during extraction, but the children were practically still-born. No severe laceration of the pelvic floor or perineum occurred and the mother made an uninterrupted recovery.

Fig. 36.

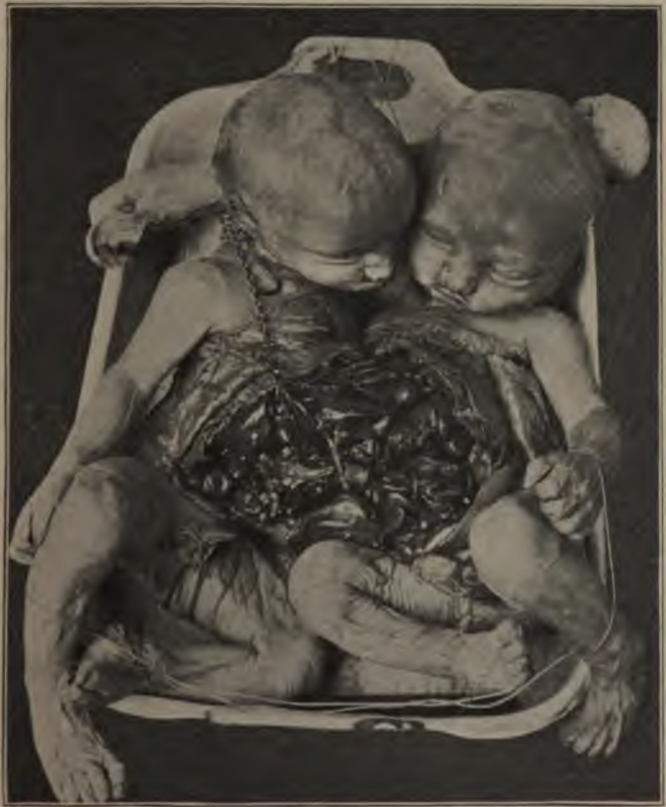


Conjoined Twins.

On examination, the weight of the entire specimen was twelve pounds. For the anatomical description the writer is indebted to Dr. W. S. Forbes, Professor of Anatomy in the Jefferson Medical College.

The twins were joined by a band extending from the ensiform cartilage to a point midway between the ensiform and the symphysis pubis in each fœtus. This band measured vertically 3 inches, antero-posteriorly, 1½ inches, and horizontally, 2½ inches. There was one common umbilicus in the middle line of the connecting band and on its inferior surface. The umbilical opening contained one vein, four arteries and one urachus. The urachus after entering the umbilicus bifurcated, and each bifurcation traversed the band to the right and left and entered the abdomen and passed to the summit of the bladder of each fœtus. The umbilical vein passed through the connecting band and beneath a fissured mass which was found to be the livers of both children, which were coalesced. This common

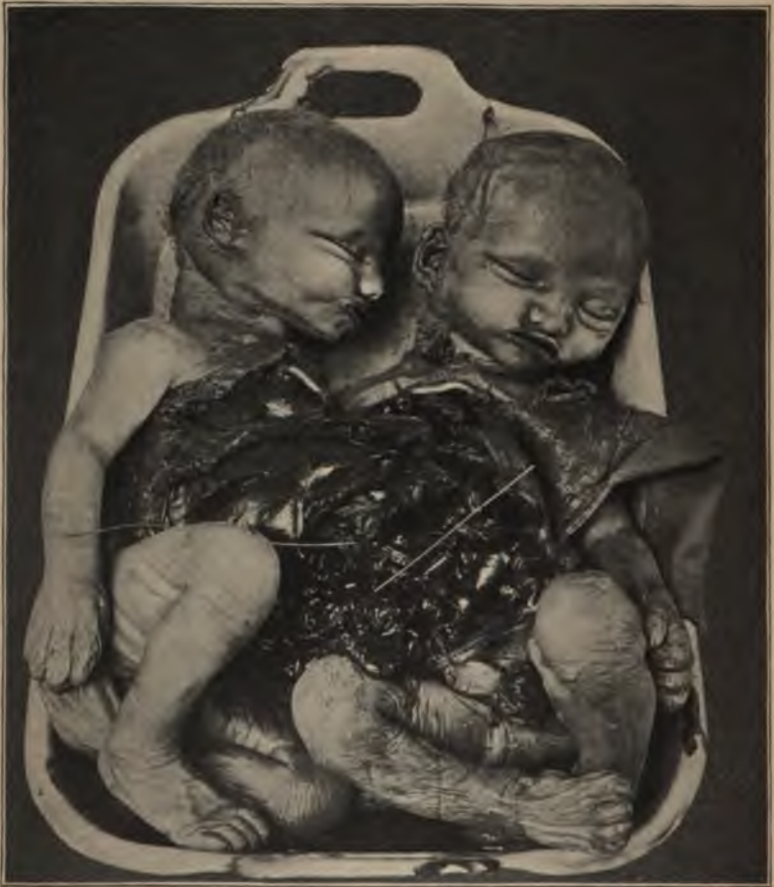
FIG. 37.



Conjoined twins, showing liver and umbilical vein common to both.

liver extended through the connecting band from the abdomen of one fœtus to that of the other. The umbilical vein bifurcated, one branch going directly to the vena cava of one of the children, the other passing through one portion of the liver in the connecting band and entering the vena cava of the other child.

FIG. 38.



Conjoined twins, showing small intestine traversing connecting band.

The diaphragms were joined, extending through the connecting band, and this portion of the diaphragm was tendinous and resisting. The pericardium of one of the children extended more than one-half through the connecting band toward the other child. On opening this, the apex of the heart was found extending beyond the middle line of the connecting band. The pericardium of the other child likewise extended to the middle line of the band and beneath the pericardium of the first. The two pouches of pericardium found in the connecting band were superimposed, and their surfaces were united on an oblique plane. The stomach of one of the children was larger than that of the other. The duodenum of one child passed through the connecting band and joined the duodenum of the other an inch from its pylorus. Proceeding from this union, one small intestine passed and repassed through the connecting band from one abdomen to the other, then bifurcated in the abdomen of one of the children. Sixteen inches below the point where the two small intestines joined, one bifurcation passed through the connecting band to the cæcum of one of the children, while the other proceeded normally to the large intestine of the other child. There was a normal appendix in each child.

This case illustrates the fact that separation of conjoined twins is usually impossible. Such was the case with the Siamese twins, as proven by autopsy.

The Diagnosis of Fœtal Abnormality.—The diagnosis of the presence of an abnormal fœtus requires accurate observation and patient study in many cases. Occasionally the history of the patient's previous labor will call the attention of the physician to a possible repetition of some of the complications from which she is suffering. Thus, in a woman who has given birth to several abnormal children there is reason to fear a similar experience in subsequent pregnancy. Except in the case of very corpulent women, inspection of the shape of the abdomen will often call the attention of the physician to the condition present. He will, however, gain most valuable information by the practise of palpation, rendered possible, if necessary, by the assistance of anæsthesia. It is often needless to put these patients completely to sleep, but the inhalation of a small amount of bromide of ethyl or of chloroform will enable the physician to palpate the abdomen with ease. It must be remembered that a full bladder can greatly obscure diagnosis by palpation, and hence the catheter should be passed where it is not positively known that the bladder is empty. The physician's attention in external examination will be attracted by the irregular contour of the fœtus, and by the anomalous masses found within the uterus. In cases of hydrocephalus the head cannot be made to engage at the pelvic brim, but can easily be moved from side to side, lodging against the brim of the pelvis. In cases where the cranial bones are deficient the converse may be true, and the ill-developed head may enter readily into the cavity of the pelvis. In cases where the limbs are absent or deficient, if the patient be a multigravida, it may have been noted that the fœtal movements are less active than normal. In joined monsters the contour of the uterus and the outline of its contents are so anomalous as to make an accurate diagnosis by palpation impossible. When the cervix is sufficiently dilated to permit the introduction of the finger, combined examination with anæsthesia is especially valuable. An idea may thus be gained of the shape and size of the fœtal cranium, the position and size of the fontanelles and sutures, the degree of ossification of its bones, the presence or absence of meningocele, while fœtal tumor can often be recognized in this manner.

Auscultation.—Upon auscultation in cases of hydrocephalus where the head presents, the heart-sounds will be heard at a higher level than normal. Should the breech present, the enlarged skull will force down the fœtal body, and heart-sounds will be heard at or below the umbilicus. In joined monsters the situation of the heart-sounds and their recognition are often determined with the greatest difficulty.

Labor with Abnormal Fœtus.—The course of labor, where the fœtus is abnormal in size and shape, varies with the deformity which it presents. The size and contour of the pelvis, the condition of the soft parts of the birth-canal, and the strength or weakness of the mother's uterus have much to do with determining the character of the labor. In cases where the child is greatly in excess of the capacity of the pelvis, dilatation is exceedingly slow, because the failure of the presenting part to enter the pelvis removes one of the factors in opening the mouth of the womb. Should the membranes rupture, labor-pains are often strong, and even excessive for a short time, when the uterus gradually passes into a condition of tetanus which threatens rupture. As the lower uterine segment becomes excessively thinned, the lower edge of the upper segment, called the contraction-ring, rises in the abdomen until it may be found midway or more between the umbilicus and the pubes. The uterus is hard to the touch, and pressure upon it causes great pain. The patient's temperature rises 1° or 2°, while her pulse increases to 100 or more, and exhaustion threatens. The occurrence of rhythmical uterine contractions ceases, the uterus remaining tightly contracted upon the fœtus. In cases where the head of the fœtus can enter the pelvis, but the obstacle to delivery is found in the fœtal body, the head may be born while the body remains within the womb.

Labor with Joined Monsters.—Where joined monsters are present, each is rarely of excessive size. Like twins, each is smaller than the average fœtus, and hence it is possible for spontaneous delivery to take place, the birth of one fœtus occurring with the mechanism commonly styled spontaneous evolution. The first born of the two is usually expelled very much as in normal labor, while the second is born with an anomalous mechanism, the nature of which is determined by its peculiar shape, consistence, and attachment to its fellow. Where labor-pains are strong the abnormal fœtus is greatly compressed and distorted by its tedious and difficult birth. Many are stillborn from this cause.

The Treatment of Labor with Abnormal Fœtus.—In dealing with cases where the fœtus is excessive in size, if the patient comes under observation sufficiently early, palpation should be practised at intervals from the sixth month to the period of full viability. When it is found difficult to bring the head of the fœtus to engage, labor should be induced. When the fœtus occupies a breech presentation, it should be turned by external version prior to the induction of labor. Where the case is first seen when the child is so large that the head cannot be made to enter the pelvis, the degree of disproportion should be estimated as carefully as possible, and the appropriate method of operative delivery should be chosen. If the patient will consent, she should be allowed to go to term, in the interests of the fœtus, as delivery by abdominal section is no more difficult at term than prematurely, while the child's chance of life will be much better. If, however, the patient will not wait until term, labor should be induced and the patient's natural resources tested, while the physician stands ready to interfere in any manner indicated.

Hydrocephalus.—By hydrocephalus is understood the accumulation of serous fluid within the fœtal cranium. This is often called internal or external hydrocephalus. By the former term those cases are described in which the fluid is external to the brain proper, and between the meninges and the cranium. By internal hydrocephalus is meant the accumulation of fluid within the ventricles of the brain. These two conditions are often present in the same fœtus. Hydrocephalus may result from any of the causes producing fœtal dropsy. It is often associated with derangement in the mother's health, and may be seen more than once in children born of the same parents. Its existence may be inferred during pregnancy when the abdomen of the mother is abnormally distended, and when, by palpation, an abnormally large and soft head is observed at the pelvic brim or at the upper extremity of the uterus. By vaginal examination, when the finger can be introduced through the cervix, the hydrocephalic cranium is felt smooth and distended, the sutures and fontanelles being largely increased in size, with the characteristic firm, bony resistance of the fœtal cranium being absent. These cases are often associated with other defects in the development of the fœtus, and the hydrocephalic fœtus is necessarily of feeble vitality.

The Treatment of Labor with Hydrocephalic Fœtus.—In dealing with hydrocephalus patients must not be allowed to become exhausted by a tedious first stage of labor. Dilatation may be well hastened by elastic dilators, and, when complete, a portion of the fluid within the skull must be evacuated. While it is desirable to save the child's life, it must be remembered that hydrocephalus in many cases is accompanied with other defects of organism which render the life of the individual impossible, or, at best, most unfortunate. Defective development of the eye, ear, and other organs of sense is not infrequently present in these cases. This fact will naturally lead the physician to consult the mother's interests, with less regard to those of the fœtus, when dealing with cases where hydrocephalus is present. To evacuate the fluid from the skull, a trocar and rubber tube are usually employed. An aspirator may be used, although much less conveniently. In cases where delivery is imperative any sharp-pointed instrument may be thrust into the skull, followed by the finger of the operator. As the bones of the hydrocephalic skull are thin and flexible, the operator can readily enlarge the opening with his fingers.

Puncture should preferably be made through a fontanelle, and as much fluid allowed to escape as possible. This may be followed by such a reduction in the size of the head as to permit the birth of the child by spontaneous delivery. Should this not be the case, the physician may attempt to deliver the head by thrusting his fingers into the opening and making traction in this manner. A much better and safer plan is to introduce the cranioclast deeply within the skull, and, grasping the head securely, to deliver it by gentle axis-traction. In cases of hydrocephalus in which the breech presents, puncture may be made through the base of the skull or the spinal canal may be opened.

Treatment of Labor with Excessive Development of Fœtal Shoulders.—Cases are sometimes seen in which a defective cranium is present, with an abnormal development of the child's shoulders. The head is readily born in these cases, while the shoulders remain at the brim of the pelvis. To complete such a delivery the shoulders must first be rotated in one of the oblique diameters of the pelvic brim, and traction be made upon the lower shoulder by passing one or two fingers into the axilla. By pulling downward and backward, it is often possible to bring the lower shoulder well down upon the pelvic floor. When this is accomplished, traction should be made in the other axilla, and the upper shoulder be brought beneath the pubes. The lower shoulder may then be delivered over the pelvic floor, while the upper bears against the subpubic ligament. In accomplishing this delivery one or both of the clavicles may be fractured. The result is an immediate reduction in the size of the shoulders as the scapulæ fall forward toward the axillæ. Some operators prefer to anticipate this result by cutting one or both clavicles with strong, blunt-pointed scissors. In some cases this is accomplished without especial difficulty.

The Treatment of Labor with Tumors of the Fœtus.—Fœtal tumors of the neck, chest, abdomen, and back may occasion difficulty in labor. Thus, a parasitic fœtus may be attached to its fellow in the sacral region, and, with the breech of the well-developed child, form a mass difficult to deliver. In these cases, if the obstruction be a fluid tumor, its contents must be evacuated, while, if it be solid, sufficient must be removed to permit delivery. It is absolutely necessary in these cases to employ complete anæsthesia, and to obtain full dilatation of the womb. Long-handled, blunt-pointed scissors are the safest instruments to employ, preceded and guarded by the fingers of the operator. For extracting severed portions of the fœtus, long, blunt-pointed forceps are best adapted, while for removing masses of considerable size the cranioclast is most convenient.

The Treatment of Labor with Composite Monsters.—In aiding the delivery of composite monsters traction by the fingers is usually sufficient. Decapitation, or any other form of embryotomy, should be employed whenever necessary. In performing decapitation the blunt hook and blunt-pointed scissors are the safest instruments.

The obstetric forceps is rarely available for delivery in these cases. Owing to the abnormal contour of the head, the forceps cannot fit accurately upon the head, and hence a secure grasp cannot be obtained. In hydrocephalus the elasticity of the skull positively forbids the use of forceps.

SECTION III.

THE PHYSIOLOGY OF PREGNANCY.

CHAPTER IX.

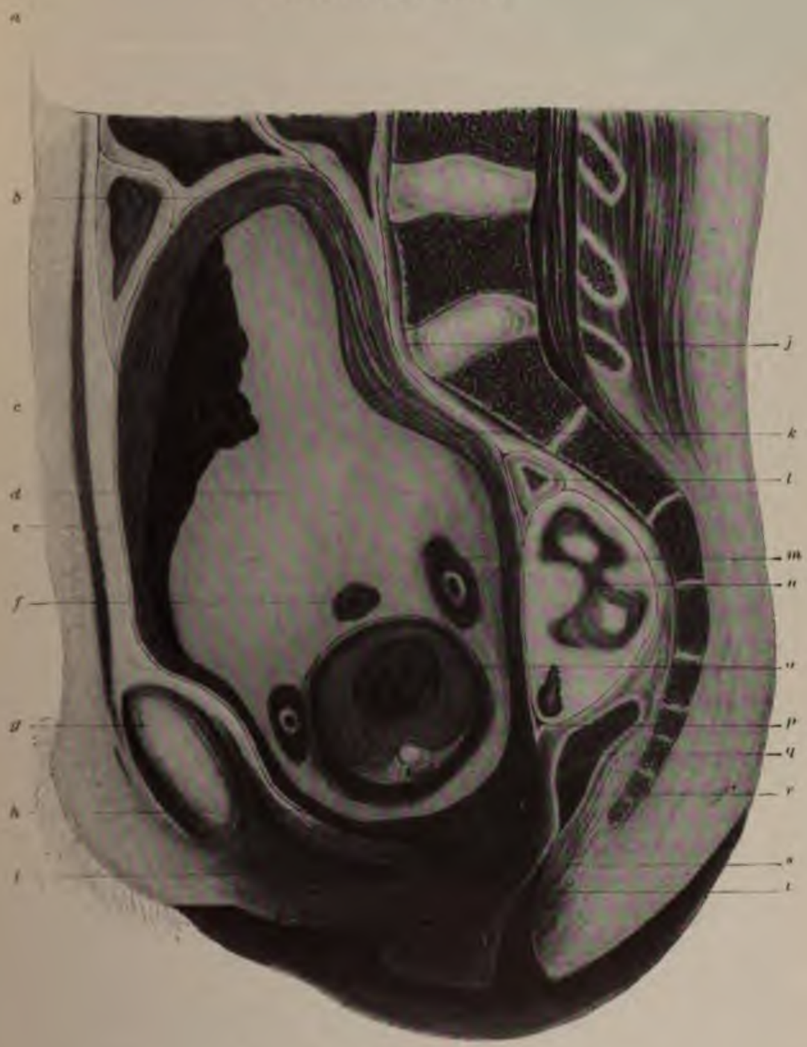
DEVELOPMENT OF THE GENITAL TRACT DURING GESTATION.

In a healthy woman, from the time of conception until the moment of birth, the functions of the organism accommodate themselves to the increased demands upon them. To accomplish this an actual increase in the cellular elements of the body occurs, which resembles the growth and multiplication of the component parts of a fruit-bearing plant.

Changes in the Uterus. The Formation of Deciduous Membranes.--It is natural that that part of the mother's body which directly contains the fœtus should be the seat of the most pronounced and interesting changes. As the ovum develops, the womb must also develop to accommodate its inmate. The most important modification in the womb is the formation of its deciduous membranes; these, like the leaves upon tree or plant, develop with the ripening of the fruit, and are cast off after its fall: hence the term deciduous, meaning something which is formed for temporary needs and passes away when those needs are satisfied.

The lining membrane of the pregnant uterus may be conveniently divided into three portions--one which lines the body of that organ, appropriately termed the uterine decidua; the second is that portion directly beneath the impregnated ovum, and upon which it rests; this subsequently develops into the placenta; the third is a layer of decidua which covers the free surface of the ovum, and hence is appropriately termed the ovular decidua. Of these the most important is the placental decidua, whose cells are brought into direct contact with the villi of the chorion, and through which nutrient material and some of the infective germs have been proved to pass. The ovular decidua gradually disappears as the ovum increases in size, until, in a recent specimen, it is not always easy to demonstrate the existence of this membrane. The uterine decidua, although undergoing a general hypertrophy during the development of the ovum, gradually disappears after birth through fatty degeneration. Histological examination of the deciduous membranes shows a free proliferation of decidual cells. In the placental decidua, by the infolding of layers of epithelial cells, the so-called utricular glands, into which the villi of the chorion were thought to be received, are formed. In the uterine

PLATE VII.



Pelvis and Contents. Fifth Month of Pregnancy. (WEBSTER.)

a. Level of umbilicus.
b. Fundus uteri.
c. Placenta.
d. Liquor amnii.
e. Venous sinus.
f. Umbilical cord.
g. Symphysis pubis
h. Utero-vesical pouch.
i. Bladder.
j. Promontory.
k. Junction of upper and lower uterine segments of posterior wall.
l. Bit of rectum.
m. Arm of fœtus.
n. Dermoid tumor of right ovary.
o. Fœtal heart.
p. Pouch of Douglas.
q. Rectum.
r. Os internum.
s. Os externum.
t. Anterior fornix.

decidua, microscopic examination shows large nucleated cells, many resembling an oyster in shape, and easily distinguished from other simple cells of the body. The microscopic appearance of these cells is of interest in view of the diagnosis of ectopic gestation. In the latter condition a discharge of blood and shreds of membrane occurs, the membrane being the uterine decidua. If, in a case having the symptoms of ectopic gestation, shreds of membrane found in the discharge prove, by microscopic examination, to be decidua, the attention of the physician is at once called to the condition present. After normal labor the hypertrophied decidua is cast off in the lochia, the parts returning to their original condition.

Changes in the Body of the Uterus.—The most interesting and remarkable changes which the generative organs undergo during pregnancy are found within the body of the womb. The various elements of the uterus undergo marked increase; the muscle fibres grow by hypertrophy, each fibre becoming from seven to eleven times longer and from two to five times thicker than normal. In addition, new muscle fibres develop from embryonal cells of muscle elements in the tissue of the uterus. The connective tissue surrounding the muscles increases by hyperplasia. The walls of the uterus increase to 5 cm. in some cases, although the point at which the ovum is attached becomes thinner during the latter half of pregnancy. The arteries are not only larger in calibre, but longer, and proceed spirally among the muscle fibres. The veins increase in networks, and at the point where the placenta is attached they broaden into sinuses containing an abundant supply of blood. The lymphatics divide up in like manner, while from the ganglia in the substance of the uterus the nerves increase in thickness and in length. The peritoneal covering of the uterus does not become thinned, but hypertrophies with the rest of the organ. The total increase in the uterus may be inferred from the fact that at the end of gestation it is usually 38 cm. long, 26 cm. wide, and 24 cm. deep. Its weight is 1,000 gr., which is more than thirty times the original weight of the uterus. In shape the uterus grows considerably in width, unfolding the broad ligaments on each side, drawing the tubes and ovaries upward and against the wall of the uterus and allowing the round ligaments to extend more transversely.

The position of the uterus naturally changes as pregnancy advances. At the end of the third month it practically fills the pelvis, thence proceeding upward to the umbilicus at the sixth month, to the hypogastrium at the ninth, and in the tenth descending somewhat from this position. Increased weight causes the uterus to prolapse somewhat forward, so that as pregnancy advances the anterior wall of the uterus and the abdominal wall are brought into close relation. At the end of pregnancy the uterus lies toward the right of the median line of the abdomen, and is partially rotated upon its axis so that its left border is nearest to the abdominal wall. (Plate VII.) This position alters somewhat with the posture of the patient, for when she is standing the uterus tends to fall forward; when the patient reclines, it sinks against the vertebræ, and by gravity tends toward the side of the abdomen when the mother is in the lateral position. In the early months of pregnancy, as the embryo grows, the uterus is pear-shaped. Later the body of the womb is more globular, and toward the end of pregnancy the uterus is largely egg-shaped, the point of the egg terminating at the cervix. The blood supply of the uterus is so free that during early pregnancy the consistence of the womb is much altered, and by palpation it resembles a cystic tumor. It is sometimes difficult to positively recognize the uterus. As pregnancy advances the uterus develops a high degree of reflex excitability, which finally results in rhythmical contractions of the womb, forming one of the signs of pregnancy.

Attention has already been called to the asymmetrical development of the uterus as a sign of pregnancy. During the early months that portion of the womb in which the ovum remains naturally increases greatly in size, while the remainder of the womb does not. During this time the uterus is irregular in contour, closely resembling a fibroid or cystic tumor. As gestation advances it becomes symmetrical in outline. Its contractions are always rhythmical in nature, readily excited by examination or by fœtal movements, persisting throughout the length of the uterus in wave-like motion.

The Fallopian Tubes.—The Fallopian tubes share with the uterus in the general hyperplasia of the genital tract. The muscular coat of the tubes and their serous coat become hypertrophied, while the glandular lining increases in cellular elements.

The Ovaries.—An actual increase in the size of the ovary has not been positively determined. The formation of the corpus luteum of pregnancy and the differences existing between it and the same body when pregnancy is not present have already been described.

The Bloodvessels.—The bloodvessels of the genital tract show a marked tendency during pregnancy to become enlarged and tortuous; this is well illustrated by varicose veins of the vagina, which are of not infrequent occurrence. A similar condition is occasionally discovered in the veins of the broad ligaments. During post-mortem examinations of women dying during or immediately after labor these veins have been found very much enlarged and tortuous.

The Vagina and Pelvic Floor.—The vagina becomes during pregnancy darker in color than is normal, being of a dusky bluish tinge; its bloodvessels are sufficiently enlarged to pulsate strongly, and this sign has been taken to indicate the pregnant condition. The mucous glands and follicles of the vagina secrete more abundantly than in the non pregnant, and in healthy and uncontaminated women this secretion, strongly acid in reaction, forms an antiseptic agent of great efficiency. Much interest has been taken in the question as to whether the secretion of the vagina in normal pregnancy contains bacteria, and whether germs thus found are those which may be termed pathogenic. It is evident that if germs capable of producing septic processes are present in the vagina before labor, that the patient must be considered as one already infected, while if such are absent the patient must be considered as practically aseptic and the responsibility for infection must rest with others. Benesis[76] and others have found the secretion of the vagina during pregnancy acid in reaction. The staphylococcus aureus was found in some of these cases, the streptococcus in some, the bacterium coli commune in others, and large numbers of other bacteria not yet distinctly classified. The germs were anaërobic and aërobic: pus-forming germs were found. Most of these germs were not pathogenetic, but some produced in animals abscesses with dark and foul-smelling secretion. Much confusion has arisen in the study of this subject from the fact that in some cases dispute has occurred regarding the identity of various forms of bacteria discovered. Making allowances for these conditions, we learn that in healthy patients the vagina before labor contains no pathogenetic and pus-forming germs. The patient is practically in an aseptic condition. Accordingly, the responsibility of the physician to practise asepsis is a direct and binding one.

In general, it may be stated that the muscular and connective-tissue planes of the pelvic floor share in the general hypertrophy occasioned by pregnancy, their increased elasticity providing for the part which they play in the mechanism of labor.

The Functions of the Secretions of the Birth-Canal During Labor.—In studying the condition of the patient during pregnancy, we cannot fail to observe the means which Nature has taken to prepare the mother for labor. During pregnancy the cervix secretes an alkaline vicid mucus, which effectually bars the os against the entrance of infective bacteria. The vaginal secretion is also an antiseptic agent of considerable power, and both secretions fit the cervix and vagina for dilatation and lubricate the birth-canal for the passage of the fœtal head. When labor occurs, these secretions are greatly increased; and as the cervix and vagina dilate the secretions of the parts not only lubricate the birth-canal, but protect the epithelium and subjacent bloodvessels from injury during parturition. If the natural circulation of the tissues is maintained, and if these secretions remain unaltered during labor, one of the great risks of septic infection is removed. In long-continued labors, where these secretions cease or become extensively altered, bacteria may accumulate and develop and take upon themselves a pathogenic activity which may produce septic infection. The antiseptic action of these secretions is supplemented by the amniotic liquid, which is a sterile alkaline fluid and which tends to sweep away clots of blood and other material which might offer food for developing bacteria.

Changes in the Breasts.—Changes in the mammary glands begin early in pregnancy, and are a valuable sign of the condition. The glandular elements of the breasts develop by the new formation of glandular follicles, epithelium and connective tissue increasing and gradually forming glandular tubules. The newly-formed and growing epithelial cells of the glands are the bodies known as colostrum corpuscles, found by microscopic examination of colostrum. There is a distinct hyperplasia of the elements of the glands. Not only does the epithelium increase, but the acini develop while the fatty tissue of the gland is gradually atrophied. The follicles about the nipple increase as pregnancy advances, and may be recognized by palpation as small granules or grains beneath the finger. Kehrer[77] estimates that these follicles are absent in 9 per cent. of cases, that they are ill developed in 48 per cent., while in the remaining cases they are numerous and often developed in two circles. They contain sebaceous secretion from the skin, and often a few drops of colostrum. Microscopic examination shows that they are rudimentary and abortive mammary glands. When pregnancy occurs in a patient who is already nursing a child, the cells already secreting milk undergo fatty degeneration and newly-formed cells take the places of the older and secrete colostrum. This accounts for the changes seen in the character of the milk in these cases. The muscular fibers of the nipple increase during pregnancy, while the blood supply of the mammary glands becomes much richer than in the non-pregnant condition. Pigment is deposited abundantly about the nipple and areola, varying in quantity and hue with the natural complexion of the individual.

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[76] Benesis: Thesis, Paris, 1902.

The Pelvis.—During pregnancy the bones of the pelvis undergo slight increase in size, in common with the other portions of the skeleton. The joints of the pelvis become enlarged and thickened by the hyperplasia of cartilage cells and by the increased secretion of synovial fluid. Even the pelvic joints, apparently having no distinct synovial sacs, become softened and enlarged through hyperæmia and secretion. These changes are more pronounced the younger the individual; the sacrum descends and rotates slightly, while the true conjugate of the pelvis is capable of change by the manipulation known as Mercurio's or Walcher's position. Where the tissues are ill developed, rupture of the pelvic joints occasionally happens in severe labor or manipulation.

Changes in the Abdominal Walls. As pregnancy advances, the abdominal walls become thinned by the pressure of the growing uterus. The degree of distention depends upon the muscular development of the patient. In strong, well-developed women the muscular tissues seem to undergo corresponding hypertrophy, and the abdominal wall is but very slightly thinned. In multiparæ and undeveloped and ill-nourished women the abdominal wall may become reduced to a great degree of thinness, so that the linea alba consists of little more than connective tissue. The linea alba becomes progressively distended as pregnancy advances, increasing greatly in width and extent. The distention of the skin is such that it has been estimated that the area of the skin over the abdomen increases 70 per cent. during pregnancy. (Kehrer.[78]) Krause and Felsenreich[79] have made investigations to determine the portion of the abdominal wall which undergoes greatest distention. By comparing observations made in pregnancy and in the puerperal period, they find that the region about the umbilicus is subjected to the greatest distention.

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[77] Kehrer: Encyklopädie der G. und G., Leipsic, 1900.

The Striæ of Pregnancy.—In about 90 per cent. of pregnant women stripes of discolored tissue appear in the abdominal wall. These are often pale in color, sometimes pinkish-red, and occasionally pigmented. They usually appear in the middle and lower portion of the abdominal wall, seldom extending above the fundus of the uterus. Shining white striæ point to previous pregnancies, while red or bluish striæ are those of a present pregnancy. Upon palpation it is evident that the tissue is extensively thinned at these points. They are often seen upon the breasts in primigravidæ, and sometimes upon the thighs.

The Brownish Line of Pregnancy.—With the majority of pregnant women, especially those of dark complexion, a brownish line develops in the middle of the abdomen, extending to the umbilicus. This may vary in form, and is caused by the deposit of pigment in the upper layers of the skin.

The Linea Alba.—Attention has already been called to the excessive thinness of the linea alba during pregnancy. The weakened condition of this tissue makes diastasis of the recti muscles a common occurrence.

The Abdominal Muscles and the Umbilicus.—The abdominal muscles naturally lose the greater part of their elasticity through the progressive and excessive distention to which they are subjected. The umbilicus is drawn inward into a triangular shape, while as pregnancy proceeds the contour of the umbilicus changes in proportion with the degree of distention present.

CHAPTER X.

THE ORGANS OF CIRCULATION—THE BLOOD.

The Heart.—As pregnancy advances the heart is pushed upward, its position becoming more flat. Gerhardt and Kehrer state that the apex of the heart is raised about 2 cm. above its usual location. Several observers found that the heart increased materially in weight during pregnancy; the wall of the left ventricle increased in thickness from one-quarter to one-third. Murmurs are heard over the valves of the heart in many cases; in a hundred patients examined by Marx, eleven times over the apex, which is the most frequent location. These murmurs are usually of transient duration, disappearing after labor, and do not indicate a serious condition. Fellner[80] found the ventricles dilated during pregnancy, and the heart-wall but partially hypertrophied. In addition to organic murmurs heard during pregnancy, others are often observed, the result of some pathological condition. The blood tension is slightly increased, which favors the development of murmurs.

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[78] **Kehrer:** Beitr. z. Klin. u. exp. Geb. u. Gyn. 1884. Bd. 2. Heft 2. p. 207.

[79] **Krause and Felsenreich:** Archiv für Gynäkologie, 1884, No. 15, p. 179.

The Bloodvessels.—The mechanical conditions which pregnancy establishes lead us to expect engorgement and dilatation in the veins during pregnancy. About three-fourths of pregnant women suffer from enlargement of the veins in the lower limbs, the vulva, and about the anus. In more than one-third the veins are enlarged in the thighs and legs, in about one-fourth in the vulva, while about 17 per cent. of pregnant women suffer from hemorrhoids. Enlarged veins in the lower limbs are usually developed on both sides, although those of the right side are usually larger than those of the left. In this respect pregnant women differ from other patients, in whom the veins of the left side are more frequently enlarged. Torsion, in addition to enlargement of the veins, is seen in many of these cases. The greater the number of pregnancies, the greater the enlargement of the veins. With primigravidæ, enlarged veins develop as early as the second month.

The Blood in Pregnancy.—When the weight of the blood and that of the entire body is estimated, it is found that in the non-pregnant patient the relation of the blood to the body is that of 1 to 13, while in pregnancy this ratio is diminished 1 to 12, 11, or 10. It must be remembered that the weight of the body increases, and that the blood must increase correspondingly to preserve a normal ratio. Thus the actual quantity of the blood is increased, but so also is the total weight of the body. The old belief that pregnancy induced hydræmia can no longer be considered correct. In anæmic patients and in those whose digestion is greatly disturbed in early pregnancy, a temporary anæmia is present. Schrader[81] found the hæmoglobin increased 13 per cent. in 73.5 per cent. of pregnant women, and in 26.5 per cent. of cases a lessening of hæmoglobin of about 11 per cent. Fehling[82] found the hæmoglobin in pregnancy varying from 67 to 110 per cent. In two-thirds of cases it was under 100. Winkelmann[83] found the amount of hæmoglobin on the average 97 per cent., with a tendency to increase during pregnancy. Henderson[84] found at term that the average hæmoglobin was 68 per cent., with color index of .78. Binomi[85] observed an increase in the actual quantity of the blood with, in some cases, diminution of hæmoglobin. The red blood-cells increased during the puerperal period.

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[80] Fellner: Monatsschrift f. G. und G. Band 14, Heft 3, 1901.

[81] Schrader: Dissertation, Munich, 1890.

[82] Fehling: Archiv. für G. und G., 1886.

[83] Winkelmann: Dissertation, Heidelberg, 1888.

[84] Henderson: Journal of Obstetrics of the British Empire, February, 1902.

[85] Binomi: Annali di Ostetricia, October, 1900.

The red blood corpuscles show great variations in number, but on the average a decided increase over the number in the non-pregnant. Henderson[86] found no abnormal features recognized in red cells, but deficiency in rouleaux formation. In syphilis and eclampsia nucleated red cells are found. At term Henderson found the average number of red cells 3,906,666. This sometimes increased to 3,975,000. Binomi[87] found that red cells gradually increased as pregnancy advanced.

White Blood-Cells: Leucocytosis.—Henderson found leucocytosis invariably present in varying degree in pregnancy. We have already called attention to the fact that this point may be of value in diagnosticating the condition. Henderson found the white corpuscles at term to average 21,365. Cabot, on examination of the blood, found that most primiparæ show moderate leucocytosis during the latter months of pregnancy. Digestion leucocytosis during pregnancy does not occur. Multiple pregnancy diminishes leucocytosis. Where female children were born, leucocytosis was greater than where male children were born. Nannicini[88] attributes the leucocytosis of the primigravida to an autointoxication which overloads the blood with waste product.

Fibrin.—The blood in pregnancy shows a decided increase in fibrin, estimated by Nasse as 3 per cent., and thought to accompany the development of leucocytosis.

The Pulse.—Kehrer[89] has described the pulse of pregnancy as a variation, followed by a steady pressure. In other cases there is the usual apex of the pulse curve, followed by sinking in pressure. In a third form there is a continuation of high pressure through two periods of counting. Fellner[90] believes that the blood tension normally increased during pregnancy, increases with uterine contractions, and falls during the intervals between the pains. Queirel and Reynaud[91] examined 68 patients to determine blood pressure during pregnancy, labor, and the puerperal state. Of these patients, 50 were normal and 18 pathological cases. They found a steady blood pressure to the eighth month of pregnancy, when blood tension sank until term.

The Reaction of the Blood.—In a considerable number of cases Blumreich[92] found the alkalinity of the blood increased. This was accompanied in many cases by lessening of the red blood-cells. Anæmia and malnutrition lessened the alkalinity of the blood as well as its specific gravity. Alkalinity falls after labor, and remains low after labor in patients showing anæmia or malnutrition during pregnancy. The alkalinity of the blood in pregnancy is a condition which distinctly pertains to pregnancy. It is not seen in the non-pregnant to this extent.

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[86] **Henderson:** loc. cit.

[87] **Binomi:** loc. cit.

[88] **Nannicini:** Arch. ital. d. Gin. anno. 2. No. 5, p. 478.

[89] **Kehrer:** loc cit.

[90] **Fellner:** loc. cit.

[91] **Queirel and Reynaud:** Proceedings International Medical Congress, Paris, August 4, 1901.

[92] **Blumreich:** Archiv für Gynäkologie. Band 59, Heft 3, 1899.

While we may speculate as to the purpose of the increased alkalinity of the blood during pregnancy, it does not seem unnatural to suppose that this condition is adapted to maintain a practical asepsis of the pregnant patient, and has to do with the increased demands upon her functions of assimilation which pregnancy brings about.

CHAPTER XI.

RESPIRATION, DIGESTION AND ASSIMILATION.

RESPIRATION.

Kehrer states that pregnant patients at rest breathe twenty times to the minute. In one-half of the cases it is purely thoracic breathing, and in the remainder breathing of the mixed thoracic and abdominal type. It has long been observed that the respiration of pregnant patients is very easily disturbed. Kehrer and Dohrn have shown that the circulation of the pregnant patient is easily disturbed during respiration from the altered position of the heart and the size of the abdominal tumor. The thorax expands as pregnancy advances more in breadth than in length. The position of the heart is such that it is easily disturbed when the patient moves the lower extremities; hence disturbances of breathing must follow exertion.

The Capacity of the Lungs.—By comparing the vital capacity of pregnant and puerperal patients, it has been found by Dohrn and others that the capacity of the lungs is progressively decreased as pregnancy advances. The practical demonstration is seen in the pregnant woman's constant desire for fresh air and in the bad results which follow the breathing of a close and confined atmosphere by pregnant patients. Frequent fainting is very often observed among pregnant women who remain for some time in a close and ill-ventilated room.

THE DIGESTIVE ORGANS.

Salivary Secretion.—During the early months increased secretion is observed in the salivary glands. This rarely becomes a pronounced or annoying feature among women of sound health.

The Vomiting of Pregnancy.—The frequency of the vomiting of pregnancy is much disputed by different observers. Primigravidæ vomit more frequently than multigravidæ, and this symptom is most often observed during the first three months of pregnancy. In 49 per cent. of cases nausea and vomiting occur in the morning, before the ordinary time for breakfast. While this symptom is present in many healthy women, it does not assume annoying prominence except in cases of disease. Loss of appetite and dyspepsia are seen in about 30 per cent. of pregnant patients, usually in the first months of gestation. The matter ejected is usually a sour, glairy mucus, but often it is a simple, watery fluid, slightly tinged with mucus.

Constipation.—Some writers estimate that 28 per cent. of pregnant patients are constipated. Our observation leads us to believe that almost all pregnant patients suffer from constipation in greater or less degree. In the matter of treatment, pregnant patients should be considered as constipated unless the opposite can be definitely proven. Constipation in pregnancy must be largely the result of mechanical conditions. As the uterus increases in size it must encroach somewhat upon the intestine, and thus hinder the passage of fecal matter. The descending large bowel becomes partially filled with feces, a partial emptying of the intestine may still be kept up by the daily evacuation of a small quantity of fecal matter. This deceives the patient, who imagines that the bowels move properly because they move daily. In patients dying during labor we have twice had occasion to examine the intestine by autopsy. In one case where a patient had been long without suitable care and diet, hardened feces had begun to perforate the intestinal wall. The patient had contracted pelvis, and the delivery had been a very difficult one.

Cravings.—It has been estimated that nearly one-half of pregnant women have decided craving for some special article of food or drink. In most cases acids are especially grateful. Acids and fruit are often most acceptable during this condition, while fruit alone is relished by the majority of pregnant women. Fortunately for the patient, few pregnant women desire large quantities of sweets, while some healthy pregnant women crave fatty foods or alcohol. In pregnancy many women take a decided dislike to meat. Many cannot take coffee or desserts, while a still smaller number have prejudice against potatoes, milk, or cheese. It was formerly supposed that pregnant patients uniformly manifested extraordinary likes and dislikes for food during pregnancy, and that in many instances they especially craved strange dishes and articles of food which were practically indigestible. This we cannot believe is the normal condition of the healthy pregnant patient. A study of the natural appetite of such a patient shows that she craves fruit, as acids are necessary to maintain assimilation and stimulate digestion. She does not desire much meat, which she cannot well assimilate. She avoids large quantities of fat and sweet substances, and frequently takes milk, which is the best food for her. The so-called longings and cravings of pregnant women for extraordinary substances must be taken to indicate a diseased condition of the nervous system.

Abdominal Distention.—With many women of highly nervous temperament, excessive distention of the abdomen with gas gives great annoyance. This is partly owing to retained feces, with decomposition of fecal matter and the liberation of gas, and also to irritation of the nerves of the intestine. In some cases the distention becomes so great as to obscure the uterus from palpation, and thus interfere with a complete examination of the patient.

ASSIMILATION AND EXCRETION.

All evidence points to the fact that in the pregnant patient the organs of assimilation and excretion are considerably taxed. Many patients who, under ordinary circumstances, remain in good health while in the pregnant condition fail to assimilate and excrete properly, with resulting debility. Unquestionably, the organism adapts itself most satisfactorily in young patients, and hence the younger the mother the better is the opportunity for perfect co-ordination and for good health during pregnancy.

The Secretion of Urine. It has been estimated that the secretion of urine is increased during pregnancy in the ratio of 31 to 39. Kehrer, in some patients whom he studied, found that 76 cc. of urine was secreted hourly while the patient remained in bed. It is not yet determined whether the increase in the quantity of urine is proportionate with the body weight of the patient. The writer investigated the daily average excretion of urine in ten pregnant patients of various ages and differing in race and in development. These patients were in a hospital upon a mixed diet of plain but nutritious food and using tea in considerable quantities as a beverage. They were engaged in doing light work about the wards of the hospital. The ten patients were observed 101 days and the average quantity of urine passed daily by each was 59.92 ounces. As these patients were all in fair physical condition, under no form of medical treatment, upon a mixed diet and taking an average amount of exercise, the result may be considered as fairly an average one. Among these patients the largest quantity of urine passed in twenty-four hours was 80 ounces, and the smallest quantity, 40 ounces.

The exact determination of the alterations of the urine which pregnancy brings about is a difficult matter, because individual peculiarity, diet, and other circumstances play so important a part. It has long been supposed that albuminuria is more frequent in pregnancy than in the non pregnant. This is probably true, but in strong, healthy patients, whose physiological processes are perfectly performed, albuminuria is not present to any extent, and serum albumen only is present in small quantity. The coloring matter of the urine is much increased, sugar is not present in normal cases, and peptone is occasionally found. Cristalli* found that glycosuria often develops about the middle of pregnancy to slight degree. Small quantities of sugar must not be considered as pathological, while large amounts indicate

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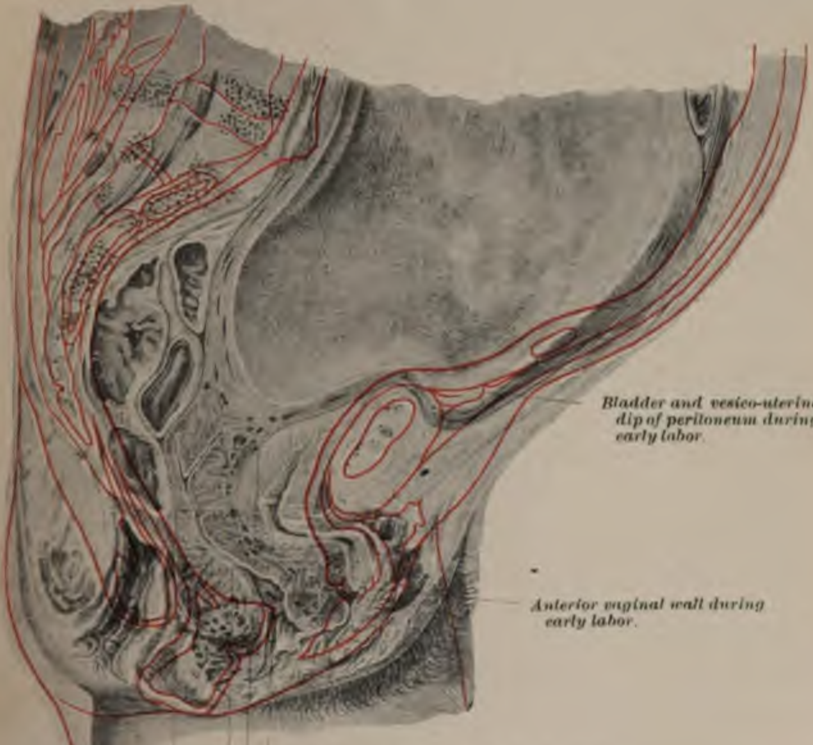
*Cristalli. Researches on [illegible] during pregnancy [illegible] the puerperal period. Naples.

PLATE VIII.


Bladder and vesico-uterine dip of peritoneum during early labor.
Anterior vaginal wall during early labor.
Anterior vaginal wall at end of pregnancy.
Vesico-uterine dip of peritoneum and bladder at end of pregnancy.
Posterior vaginal wall at end of pregnancy.
Posterior vaginal wall during early labor.

Section showing Bladder in Pregnancy. Red line indicates Parturient Section. (HART.)

derangement of the functions of the liver. Greco[94] found that sulphur is excreted in the last months of pregnancy in increased quantity in either acid or neutral urine. The proportion between sulphuric acid and neutral sulphur is somewhat greater than that in health. The phosphites are diminished in quantity during pregnancy, the relation between the alkaline phosphites and the phosphites of iron is often disturbed, and the quantity excreted diminished. Charrin and Guillemonat[95] found that glycogen increased very considerably in the liver during pregnancy, and that the ingestion of sugar and glycogen-forming substances increased this deposit. Apparently the organism in pregnancy uses up glycogen and glucose less rapidly than in the non-pregnant condition. This seems to be a preparation for the function of lactation, as after the child is born and the secretion of milk begins glycogen is used in the organism. In connection with this observation is that of Miotti,[96] who found that the quantity of fat in the cells of the liver increased considerably during pregnancy. Roussel[97] and others have found acetone in the urine during pregnancy, but in small amounts. Its presence cannot be considered as pathological unless it increases considerably. It is interesting to note in connection with the metabolism of pregnancy that the pigment so abundantly seen in many cases is not derived from the coloring matter of disintegrated blood, but seems to be an excess of the natural deposit, caused by increased nervous stimulation.

The Voiding of Urine During Pregnancy.—Increased frequency of micturition has long been known as a sign of the pregnant state. This naturally arises from the pressure of the growing uterus upon the bladder, especially while the patient is in the upright position. Kehrer found that 57 per cent. of patients suffered from disturbance of this sort. In 50 per cent. the condition was limited largely to the last months of pregnancy. As the head of the child enters the pelvis, its pressure lessens the capacity of the bladder, and thus increases the frequency of micturition. In 18 per cent. the patient suffered during the entire duration of pregnancy. Pressure seems to be exerted at the fundus of the bladder, and also at the sensitive orifice of the bladder. (Plate VIII.) The mucous membrane of the bladder during pregnancy is congested, and more than usually sensitive and irritable. Among multiparæ, involuntary discharge of urine is not infrequent. This occurs whenever the intra-abdominal tension is greatly increased, as in lifting a heavy weight, in sneezing, or coughing, or vomiting. Very rarely retention of urine is observed during pregnancy, and this must be considered as a pathological condition pointing to retroflexion of the pregnant uterus.

Temperature of the Uterus.—That the metabolism of the body in pregnancy is more active than normal may be inferred from the increased temperature of the uterus. Vicarelli[98] found that the temperature of the pregnant uterus is always higher than that of the non-pregnant. Between four and five in the afternoon the temperature of the pregnant uterus sinks. The temperature of the fœtus, as measured in cases where it is possible to insert a thermometer into the mouth or rectum of the child during labor, was .2 of a degree more than that of the uterus.

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[94] Greco: Archiv ital. di Ginec. Naples. No. 5. p. 439.

[95] Charrin and Guillemonat: Comptes Rendus de l'Academie des Sciences. Vol. 130, p. 673.

[96] Myotti: Annali di Ostetricia. No. 9. p. 733.

[97] Roussel: Annales de Gynecologie. Vol. 53, p. 161.

Increase in Weight.—Experiment shows that during the last three months of pregnancy the healthy mother increases considerably in weight. This increase is constant, being most pronounced in the eighth month and diminishing about half in the ninth.

The Chloasma of Pregnancy.—The superficial layer of the skin is much increased during pregnancy to accommodate the increased distention of the tissues. Pigment is deposited about the nipples, about the genital organs, and in the centre of the abdomen, but, in addition to this, a brownish color frequently spreads over the face, known as the mask of pregnancy, or chloasma. This consists of pale, brownish discoloration in the form of blotches, with sharp or obscure borders upon the forehead, cheek, nostrils, and other portions of the head. In greater or less extent it is present in two-thirds of pregnant women. No adequate explanation has been given for its occurrence, and it is supposed to be dependent upon the action of the nervous system. It usually disappears when pregnancy ends.

The Action of the Skin During Pregnancy.—In many women increased elimination is efficiently secured by the increased action of the skin. In some cases perspiration becomes so excessive as to greatly annoy the patient and require frequent changes of clothing. Perspiration is sometimes acid in reaction and irritating in character.

The Action of the Lungs During Pregnancy.—While it is almost impossible to accurately measure the excretion by the lungs of the mother, we know sufficiently to recognize the fact that the action of the lungs is greatly increased during pregnancy. This the mother demonstrates by her instinctive craving for fresh and cool air.

Changes in the Skeleton During Pregnancy.—In common with the increased nutrition of the body during pregnancy occur those changes in the skeleton which demonstrate the growth of the bony portions of the body. In the epiphyses and periosteum new formation of bone occurs, and development of the muscular and cutaneous tissues accompanies this, and it is a common experience to see an ill-developed and slender person becoming robust and plump during a healthful pregnancy. The pelvic bones increase in size, the joints become looser, and greater motion is present as pregnancy advances. The formation of callus in fractures occurring in pregnant patients is slower than that seen in the non-pregnant. Rokitansky long since called attention to the development of osteophytes in the cranium of the puerperal patient. These deposits are seen on the inner portion of the forehead and parietal bones, accompanied by thickening of the dura mater. The process is one of engorgement of the periosteum, with the deposit of bony material.

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[98] Vicarelli: Arch. ital. di Biol. Vol. 32. Heft 1. 1899.

The Posture and Stature of the Body.—The general increase in the size and the growth of the abdominal tumor bring about changes in the posture as well as in the stature of the body. The constant tendency is for the patient to throw the chest and shoulders backward, the better to support the increased abdominal weight. The lower portion of the sternum is pushed forward, the hips project backward, the neck is straightened, the thoracic vertebræ are strongly bent, and the lower vertebræ are straightened. The degree of change in the curvature of the body depends naturally upon the size of the abdominal tumor and the general strength and development of the patient.

CHAPTER XII.

THE NERVOUS SYSTEM.

Increased Reflex Excitability.—Several causes combine to produce a condition of increased sensitiveness and excitability in the nervous system of the pregnant patient. Tridondani[93] found that the skin reflexes, with the exception that those in the abdominal region are much less sensitive than normal. The tendon reflexes, and especially the patellar reflexes, are exaggerated. In healthy patients the pharyngeal and pupillary reflexes are somewhat diminished, while in the pupil the eye is seen to react less quickly to light, but more in the accommodation. The reaction to the faradic current is much diminished. These phenomena are more exaggerated in primiparæ than in multiparæ, and are especially pronounced at the end of pregnancy. In about ten days after the birth of the child the condition returns to the average or normal. It is thus seen that, while in some portions of the body the reflexes are diminished, especially about the regions connected with the genital organs, the reflexes are much increased. It has been found that the intestine during pregnancy is, at its termination, much more irritable than in the non-pregnant, and slight operations upon the rectum or the use of the cautery are often followed by abortion.

Psychic Changes in Pregnancy.—Kehrer found, by examining a number of hospital patients, that in more than one-half the mental condition was one of increased activity and buoyancy, and in slightly less than half the patient tended to be melancholic. The condition of melancholy was caused sometimes by fear of approaching confinement, and especially if the patient had already passed through a difficult labor, by alterations in the sphere of the affections, by which the patient imagined that those about her had ceased to have regard for her, or by some hysterical manifestation, which in some cases was found to be due to a toxæmic condition. In other cases joy at approaching maternity and interest in the coming child aroused in the mother a condition of mental exhilaration.

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[93] Tridondani: Annali di Ostetricia, March, 1900.

Disturbances of Sleep.—In about one-fourth of cases of pregnancy sleep is greatly disturbed. Restlessness may be induced by exaggerated fœtal movements and by mental disturbance. In some cases the inability to sleep becomes so pronounced as seriously to weaken the patient. Occasionally the patient sleeps unusually long and heavily.

Syncope.—Attacks of syncope are not uncommon during pregnancy. Nervous neurasthenic, ill-nourished, and hysterical patients are especially prone to them. Mental disturbance, overcrowded and overheated rooms, long sitting or standing, or other causes which tend to depress the mind, may bring on such attacks. That the vasomotor nervous system is unusually sensitive is seen in the rapid changes in the color of the face frequently observed among these patients. It has been suggested that reflex irritation of the genital organs caused sudden changes in the circulation of the blood, producing anæmia of the brain and syncope.

Neuralgia.—Without apparent cause, a considerable number of pregnant patients suffer from pain in the teeth during gestation. In one-third of cases of pregnancy neuralgia occurs in the nerves of the pelvis and lower extremities. In most cases the pain is upon both sides of the body, less frequently upon one side only. Increased sensitiveness and abnormal sensations are not infrequently found in these parts. Less often these abnormalities are present in the arms and neck. It has been supposed that the pressure of the fœtal head in the pelvis is the most frequent cause for pain in the nerves of this region of the body. Others think that the increased circulation of the pelvis brings blood pressure to bear upon the roots of the pelvic nerves, thus causing increase in the sensitiveness of the part. In highly excitable and neurotic women attacks of pain in the nerves of the lower extremities may come on suddenly, paroxysmal in character, and cause great suffering. The patient may be suddenly seized with severe pain and obliged to change her posture at once. In many cases cramp-like pain in the lower extremities ceases when the patient reclines upon her side and flexes both thighs.

The General Condition of the Nervous System During Pregnancy.—The general condition of the nervous system during pregnancy is a phenomenon demanding careful attention by the physician, and is a valuable index of the general state of the patient's health. It is certainly unnatural for a patient to be habitually and profoundly depressed or unduly excitable, irritable, and disturbed. In either event, some physical condition exists which cannot be considered physiological. In some cases the first intimation of pregnancy is a marked increase in general good feeling. Some patients are strongest, happiest, and healthiest when in this condition. While this must be considered as not the usual experience, it must be kept in mind as indicating the fact that in healthful women pregnancy produces a naturally stimulating and not a depressing effect; but that the influence of the mind is great in pregnancy there can be no doubt. Every effort should be made to surround the pregnant woman with agreeable circumstances, and make her life during this period as hopeful and peaceful as possible. Rest in pregnancy is most important. Abundant observation shows that children born of mothers who have been deprived of rest are ill developed, ill nourished, and more excitable and irritable than those in whom the mother has had abundant repose. The fœtus is probably more injured by lack of rest in the mother than by any other factor short of actual disease or accident. Limited food may impoverish the mother, but does not so readily affect the child as long deprivation of rest and disturbance of the nervous system.

CHAPTER XIII.

THE HYGIENE OF PREGNANCY.

The Genital Tract.—The care of the genital tract during pregnancy naturally divides itself into three requirements. First, to secure uninterrupted development for the uterus and its contents; then to secure proper nourishment and rest for the mother, and finally to guard the mother from infection, or, if such has already occurred, to neutralize its effects as far as possible. The first requirement is met by the avoidance of disturbance of the genital tract in every way during pregnancy. Not only should this be done, but the patient's clothing should be so arranged that the uterus can readily rise out of the pelvis into the abdominal cavity. Those forms of exercise most apt to disturb the pelvic organs must be omitted, such as running a sewing machine, climbing steep stairs, reaching high above the head, riding, lifting a heavy weight, or straining in any way. Rough roads should be avoided in driving, and prolonged railroad journeys are injurious. Any motion or circumstance which subjects the patient to violence should be carefully avoided. Manipulation of the genital organs should not be undertaken if possible during the pregnant condition. A condition of gravity threatening the patient's life and health is the only excuse for operations or applications during this period.

The Avoidance of Infection.—In healthy women the genital tract must be considered aseptic and allowed so to remain. In patients troubled by chronic vaginal discharge the use of douches may be indicated, and these should be administered with the patient in the recumbent posture, with the fountain syringe not higher than three feet above the patient's body and the fluid sterile and unirritating. Boiled water only or the mildest and most unirritating antiseptics, as boracic acid or 1 per cent. lysol, should be used. Piston syringes and those working with valves should under no circumstances be employed. The temperature of such injections should be that of body warmth, not exceeding 100° F.

Cases of vaginal discharge and of irritating secretions about the genitals are often successfully treated by external cleanliness only. Secretion is always increased in the genital organs during pregnancy, and hence scrupulous cleanliness must be practised during this time. Sponges should not be employed, but cloths which can be repeatedly boiled should be used. Boiled water should be used, and baths of tepid water are often most useful. A reddish or yellow discharge during pregnancy cannot be considered physiological, and must be reported to the attending physician.

The Nutrition of Pregnant Patients: **The Use of Milk.**—This important subject has received new investigation in recent studies in eclampsia and from extensive clinical observation. In pregnancy it is more than ever true that food which is assimilated produces nourishment, while that which is not causes disease. While the pregnant woman nourishes two, it is natural enough that she should eat for two. Abundant nourishment is certainly required during pregnancy, but it must be of such a character and so given that it can be assimilated and benefit the patient. The ideal food during pregnancy is milk, fruit, and bread, and the majority of pregnant women are satisfied with such diet. It is interesting to note how many feel better when diet is so ordered than when indulging in a mixed diet containing considerable quantities of meat. Milk must be pure, fresh, and may be prepared or combined in any way agreeable to the patient. It may be diluted with soda water, Vichy, or any other pure water; it may be made into junket or puddings, custards, buttermilk, or koumiss. Some patients digest milk best when salt is added, and others where lime water is used. One quart of rich milk daily, with bread and fruit, suffices to nourish the average patient. The results of the use of milk in diet are an increased secretion of urine, a more natural condition of the urine, and a better nourished state of the patient.

Fruit.—The reasons for urging the use of fruit during pregnancy are the laxative properties of fruit, especially needed in patients habitually constipated, and also the fact that many sorts of fruit contain substances acting as a diuretic. All fruits in season, if they are ripe and sound, may be used. Most valuable are apples, oranges, peaches, pears, melons, and lemons. Least useful are bananas. If fruits do not agree with the patient, they may be cooked by baking or stewing, when they are usually well digested.

Bread.—The least valuable bread for the pregnant patient is that made with fine white flour. Bread made with graham and rye or whole wheat flour is especially valuable. If white bread disagrees, it may be toasted, and no bread should be eaten when fresh and hot. Rolls may be twice heated to advantage. There can be no objection to the use of butter with bread, unless the patient is taking considerable quantities of fat in cream, when butter may not be well digested.

Other Foods.—We by no means wish to infer that the diet of the healthy pregnant woman must be limited to milk, fruit, and bread. These substances contain the essentials for her nutrition during this period. The physiologically sound pregnant patient may take a moderate quantity of fresh meat, may use all ripe, sound vegetables in season, may take simple desserts in moderation, and enjoy that diet which is really best from the standpoint of nutrition. To be avoided in the diet of pregnant patients are nuts, pickles, candies, fried dishes, shellfish, rich sauces and gravies, alcoholic beverages, cheese, large quantities of tea and coffee, sweet and indigestible dishes, pork, veal, lobster and crabs.

The Use of Alkaloidal and Alcoholic Stimulants During Pregnancy.—Most patients require for their comfort either tea or coffee during pregnancy. If they have been accustomed to use them, they may be taken in moderation, freshly made, and of good quality. The excessive use of these substances is, however, decidedly injurious. The use of alcohol in pregnancy has occasioned considerable discussion. There can be no question but that alcohol in considerable quantity is not entirely used up by the mother, but is taken in parts at least to the fœtus. As the functions of the liver are often overtaxed in pregnancy, alcohol is not a suitable and proper article of diet for the pregnant patient.

The Use of Water.—To promote assimilation, pregnant patients should drink water freely. As pure a water as possible should be taken, and at least one quart should be used in twenty-four hours. This may be taken to advantage in the morning, unless the patient is nauseated. Between her meals and before retiring she may drink water freely to advantage. The softer the water the better for her use. With many patients, Vichy agrees especially well during the latter months of pregnancy.

General Conditions Influencing Nutrition.—In addition to the food taken, the patient's nutrition will be greatly enhanced or retarded by her surroundings. Thus freedom from mental anxiety, the gratification of affection, the removal of domestic irritation and the cares of a household, rest from arduous work and overstrain, all influence the nutrition of the mother profoundly. Abundant and constant fresh air is an absolute necessity for all nutrition. The pregnant patient may also be out of doors as much as possible. She should sleep in a very well ventilated room, and her rooms at all times should contain an abundance of fresh air. Exposure to inclement weather, if the patient be well protected, is far less injurious than prolonged deprivation from fresh air.

Elimination.—The pregnant patient eliminates from the bowels, kidneys, liver, skin, and lungs. Each of these organs in turn must be kept in functional activity and in proper condition during pregnancy.

The Bowels.—In most cases a daily and efficient action of the intestine can be produced by gentle exercise, by the use of water and fruit, and by suitable clothing. Walking in the open air is unquestionably the best exercise for the pregnant woman, and may be carried to the point of slight fatigue. The use of water and of fruit are sufficient in many cases to prevent constipation. The adjustment of the clothing, so that as little pressure as possible is made upon the abdomen, is of great value in promoting a regular and free movement of the bowels. Drugs should be employed as seldom as possible for this purpose, and only by the prescription of the attending physician. The use of gluten suppositories dipped in olive oil and the injection of olive oil into the bowel are simple measures which may be used for a long time without injury. So far as drugs are concerned, cascara is useful in most cases, in some combined with podophyllin when the liver is especially sluggish. Aloes and active purgative salts should be avoided during pregnancy. Compound licorice powder is useful in many cases. Where torpor of the liver is present, calomel may be used in small doses for a week or ten days without injury. The action of the bowels is also promoted by the choice of the patient's baths. The cool sponge bath, with gentle rubbing, favors the movements of the bowels. A full bath at moderate temperature is also useful. Hot baths should not be taken during the pregnant condition. The physician must not be deceived by the fact that the patient has a daily evacuation of the intestine and suppose that she is not constipated. Unless he can demonstrate to the contrary, all pregnant patients must be considered as constipated, and treated accordingly.

The Kidneys.—The abundant use of water and of fruit are absolutely essential to maintain the action of the kidneys. The clothing is also an important factor in this regard, and when pregnant patients have occasion to change climate, as in the summer, especial care must be taken that they do not become chilled. Woolen or silk and wool must be worn next to the skin, and the patient should be kept comfortable and thoroughly warm. With some patients the use of tea or coffee increases the action of the kidneys, while with others it diminishes renal excretion.

The Liver.—The functions of the liver during pregnancy are quite as important as those of the kidneys. The diet must be chosen to avoid impairment of the liver function, and fruits and vegetables may be used freely. Mildly alkaline water, and with some patients very dilute lemonade, are useful for this purpose. In prescribing drugs for sluggishness of the liver during pregnancy, the physician should use those which are mildest only and in small doses. Exercise is especially useful with these patients.

The Skin.—The action of the skin must be maintained by bathing and by the selection of proper clothing. Baths must be neither hot nor cold, but a cool sponge bath in the morning, followed by gentle rubbing and a warm full bath at night are best adapted for the condition. The clothing of the patient should be chosen with reference to the individual. Some patients are warmer without woolen clothing than with it, and other patients require wool or wool in combination with other substances. The circulation of the patient must be maintained, her hands and feet should not be cold, and she should be comfortable and thoroughly warm under all circumstances. In hot weather her clothing must be adapted to secure her comfort at the expense of all other considerations.

The Lungs.—We cannot too strongly emphasize the need for the abundant supply of fresh air during pregnancy. Observations among peoples living in tents shows the remarkable health of women during pregnancy living entirely in the open air. Nothing is worse for such a patient than a furnace heated, hot city house, with little exercise and foul air. If the patient cannot go out in all weathers, she should not only keep her rooms well ventilated, but she should dress as if for the street and open the windows freely for some time, and thus secure a thorough airing.

While it is of the utmost importance that the nutrition and excretion of the body be properly performed during pregnancy, there are other conditions most essential for the well-being of mother and child.

The Nervous System.—It is a familiar fact that pregnant animals subjected to frequent disturbance, and to worry and anxiety, bring forth young less well nourished and less vigorous than those allowed to go through gestation in peace. With human beings freedom from anxiety and disturbance, and from those conditions which profoundly depress the nervous system, is especially desirable. There can be little doubt that the temperament of the child is profoundly influenced by the condition of the mother. The most frequent form of disturbance of the nervous system to which pregnant patients are subjected is overfatigue, resulting from the effort of the mother to continue the same life which she led before becoming pregnant. The observances of society and the many details which the care of the family bring upon a woman are often too much for a patient in the pregnant condition. In those cases where poverty and lack of proper food add their burden, the result is seen in the degenerate condition of mother and child. In the other extreme, where luxury or vice enfeeble the mother during pregnancy, the results are seen in her condition and that of the child.

The Need of Supervision During Pregnancy.—It has been frequently stated that pregnancy is a physiological function coming to a natural termination, and proceeds best without interference. This half truth has been more injurious than many positive falsehoods. In a woman physiologically perfect and anatomically perfect, and leading a perfectly balanced and natural life, it is true that pregnancy is a natural condition proceeding healthfully without interference.

When it is remembered that few patients are physiologically perfect, and that few persons lead natural and physiological lives, it will be seen that very few pregnancies proceed as smoothly and naturally as Nature intends. The average patient in all walks of life should be kept under observation during her pregnancy. Judicious care at this time may result in an improvement in her general health which may be permanent, while lack of attention may lay the foundation of disease from which the patient may not recover.

The Influence of Work Upon the Pregnant Condition.—Regular and proper employment is of positive benefit during pregnancy. Light housework in a well-ventilated house, working in a garden, or walking are all distinctly advantageous to pregnant women. No greater mistake can be made than to keep a pregnant woman idle and without exercise, for muscles thus become weakened which are needed in parturition, the nervous system is enfeebled, the patient's nutrition impaired, and she comes into labor in an unfavorable condition for parturition.

Influence of Climate on Pregnancy.—Cases are sometimes seen in which climate is an important element in the care of the pregnant woman. That climate which will permit the patient to be most out of doors is that to be selected. Very cold and damp climates, or sudden changes from intense heat to cold and damp, must be avoided. Great extremes of temperature are often very badly borne by patients in the pregnant condition.

SECTION IV.

THE PATHOLOGY OF PREGNANCY.

CHAPTER XIV.

ABNORMALITIES OF THE GENERATIVE TRACT COMPLICATING PREGNANCY.

IN normal patients, surrounded by favorable conditions, the condition of pregnancy borders closely upon a pathological state. It requires but a little in many cases to change the balance to the side of disease and to transcend the physiological and produce pathological conditions in pregnancy. It is natural to look for pathological changes in those organs of the body which are most greatly altered by pregnancy, and hence the genital tract presents most frequently pathological variations during the pregnant state.

The Position of the Pregnant Womb.—Rotation to the right side of the abdomen has been observed in the great majority of pregnant women, and this position of the womb may be considered normal during pregnancy. In some cases, through chronic adhesion or other abnormality, the uterus is so strongly rotated to the right that it counterfeits extrauterine pregnancy upon the right side.

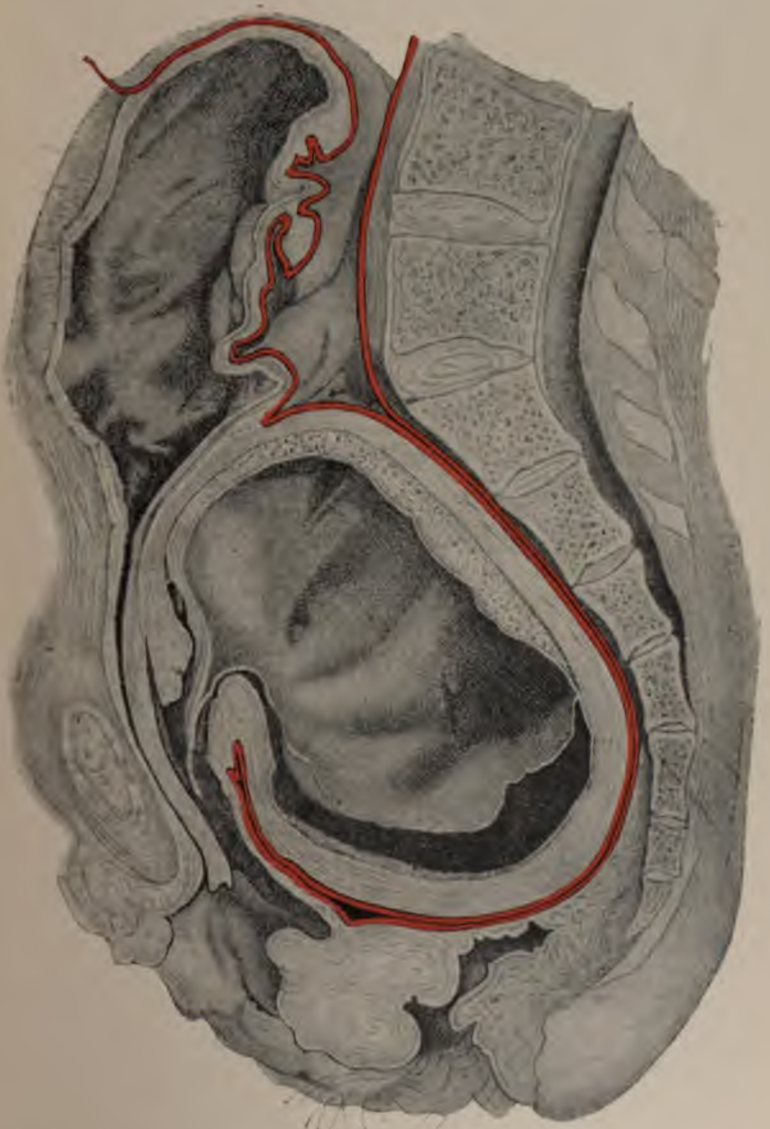
Anteflexion and Anteversion of the Pregnant Womb.—The normal condition of the pregnant uterus is one of slight anteversion, the fundus of the womb resting against the bladder when the latter is partially filled. In cases of well-marked anteflexion, where the patient wears tight clothing, if pregnancy supervenes, the uterus may not rise naturally from the pelvis. The anteflexed womb, by the pressure of the abdominal contents, is forced downward into the pelvis and against its anterior wall. A spasmodic contraction of the muscles of the pelvic region is set up by reflex irritation from the uterus, which manifests itself in pernicious nausea. The term "pelvic tenesmus" has been applied to this condition of affairs. Frequent and painful micturition, painful and dragging sensation in the pelvis, with the sensation of pressure, are also symptoms of this condition. Upon vaginal examination in these cases, the uterus is found in the pelvic cavity, the fundus pressed strongly forward against the brim of the pelvis. The effort to raise the uterus often causes considerable distress, and sometimes well-marked nausea.

The Treatment of Anterior Displacements of the Pregnant Uterus.—This condition should be corrected, because its continuance frequently causes pernicious nausea. The patient's clothing should be rendered entirely loose, and the bladder thoroughly emptied by catheter. After the bowels have been emptied, the patient may be put in the knee-chest posture, the vagina distended with air, and the pelvic contents pushed gently upward and forward. This proceeding is usually successful in relieving the condition of pelvic irritation. To make this relief a more permanent one, a pessary of carded wool may be inserted, preventing the uterus from assuming its former position. The patient may take the knee-chest posture several times daily, and should abstain entirely from constriction of the abdomen by clothing. After the early months of pregnancy this condition disappears by the gradual unfolding of the uterus.

Retroversion of the Pregnant Uterus.—In other cases a chronically distended bladder, with relaxed condition of the uterine structures, may cause retroversion of the pregnant womb. The predominant symptoms caused by these conditions are irritability of the bladder through tension upon the urethra, with partial occlusion of the urethra and overdistention of the bladder. The patient endeavors to empty the bladder frequently and succeeds but partially. A distended bladder pushes the uterus still further backward, until the womb enters the hollow of the sacrum completely retroverted. (Plate IX.) The retention of urine results in its decomposition, and bacteria contained in the bladder set up cystitis, with sloughing of the mucous membrane. Infection travels from the bladder into the surrounding connective tissue, inflammation results, and the uterus is bound down by adhesions. The patient gradually becomes septic, and may perish unless relieved. In some cases abortion occurs spontaneously with improvement in the symptoms. In others, ulceration of the bladder into the vagina relieves the patient partially by drainage. If the uterus be replaced and the bladder emptied, recovery usually follows.

Treatment.—The directly curative treatment of retroversion of the pregnant womb consists in replacing the uterus in its normal position and supporting it in that position until the womb has so increased in size that a return to its condition of retroversion is impossible. The attempt to replace the retroverted and pregnant uterus should not be made without an anæsthetic if the uterus is firmly pressed down into the pelvis and if the patient is sensitive. An antiseptic injection having been given, the physician should grasp the cervix with a pair of tenaculum forceps and make gentle traction downward and backward, while with two fingers in the vagina, placed beneath the posterior wall of the uterus, he should endeavor to raise it, carry it to one side of the sacral promontory and to throw the fundus gently forward. In some cases he may be able to exert more direct and advantageous pressure upon the uterus by the finger inserted in the rectum. While the fingers of the left hand hold the womb

PLATE IX.



Retroverted Pregnant Womb; Distended Bladder. Red line shows altered relation of Peritoneum. (SCHWYZER.)

supported in its proper position, the right hand should insert, with dressing forceps, an antiseptic wool tampon smeared with a suitable ointment: such wool may be rolled into a cylinder three-quarters of an inch in diameter and about two inches in length, the form of which is maintained by wrapping it with soft twine. A useful ointment in uncomplicated cases is composed as follows:

Powdered boric acid	grs. 10.
Lanolin Cosmolin	each ℥½.

This cylindrical tampon may be introduced longitudinally, the fingers of the left hand acting as a speculum, or a Sims speculum being employed if necessary. When introduced, it is to be turned transversely, thus putting the utero-sacral ligaments upon the stretch, raising the fundus, and tending to throw it forward into its normal position and drawing the cervix backward. In uncomplicated cases such a tampon may be left two days in position and then removed, the vagina thoroughly douched with bichloride of mercury, 1: 5,000, and another tampon inserted.

In replacing the retroverted and pregnant uterus, posture is often found of very great value. The knee-chest position, for ten minutes twice daily, will greatly facilitate spontaneous reposition. In simple cases, uncomplicated by adhesions, the patient may be put upon her left side, the pelvis being slightly elevated, and the pelvic floor being drawn backward and upward by a Sims speculum. The introduction of the finger will usually be followed by the raising of the uterus and its assuming the forward position, when the introduction of a soft pessary or tampon will be found a comparatively easy matter.

Complications.—In cases complicated by considerable tension of the tissues in the pelvis, it is best to place the patient in the knee-chest posture, when the abdominal contents gravitate forward and upward, and the uterus often accompanies them when the pelvic floor is retracted. In difficult cases, where the patient suffers greatly from pain, from fright, or from reflex irritation, an anæsthetic should be employed before an attempt is made to replace the uterus. The physician should be very careful to avoid violence in these manipulations, because adhesions may be ruptured and the contents of a pyosalpinx discharged into the abdomen, or the uterus itself may be torn where its tissues have been weakened by chronic disease.

Cases of retroversion of the pregnant uterus are often complicated by inflammation of the Fallopian tubes and by adhesions binding the uterus down in its abnormal position. It is exceedingly unwise in such a case to attempt forcibly to replace the uterus: such a procedure would incur great danger of abortion or of the rupture of a pyosalpinx, and the subsequent septic infection which this would cause. In such cases the bowels should be thoroughly moved at frequent intervals by sulphate of magnesia. In selecting material for a tampon the physician will do well to choose the softest which will answer his purpose. Surgeon's lint cut into strips four inches wide and a yard long, sterilized by baking and thoroughly soaked in glycerin to which 1 per cent. of carbolic acid has been added, makes excellent material for such a tampon. It should be introduced with the aid of a Sims speculum, the posterior vaginal wall and pelvic floor being carried downward and backward. The immediate result of such an application is a very free flow of watery mucus, which tends greatly to relieve the congestion about the womb usually seen in these cases. This tampon should be removed at the end of twenty-four hours and a second inserted. It is interesting to notice, under this treatment, the gradual softening of the adhesions and the progressive rise of the uterus out of the pelvis into the abdomen. When the tampons are changed, it is well to irrigate the vagina very gently with a creolin or boric-acid solution.

To secure a good solution of boric acid the following formula will be found useful:

Acid. boric. pulv.	℥ 5½.
Glycerin	℥ 1.
Aquæ	quart 1.

To be given at a temperature of 100° F. with a fountain-syringe.

It is thought by some advantageous to employ an alterative in the ointment used upon the tampons in these cases. Ichthyol gives good results, and may be used in an ointment containing from 25 per cent. to 35 per cent. If considerable pain, tenesmus, and sensitiveness be present, it is advantageous to combine with the ichthyol ointment belladonna, and in some cases iodoform as well.

The following formulæ have been found useful when employed with tampons in replacing the retroverted pregnant uterus:

Acid. boric. pulv.	grs. 10.
Lanolin Ung. zinci oxidi	each ℥ ½.

Ichthyol	ʒ 2.
Cosmolin Lanolin	each ℥ ½.

Belladonna may be employed in the following prescription:

Ichthyol	ʒ 2.
Extract. belladonnæ	gr. 1.
Lanolin Cosmolin	each ℥ ½.

In cases complicated by adhesions, after the uterus has been raised to its proper position, it may be maintained by an elastic rubber pessary, either a ring or a pessary shaped like that of Hodge. So far from suitable tampons or pessaries causing abortion, they are the best preventive of such an accident when suitably fitted and gently applied. Vaginal douches in these cases should be irrigations practised very gently, the receptacle containing the antiseptic being not higher than three or four feet above the bedside of the patient.

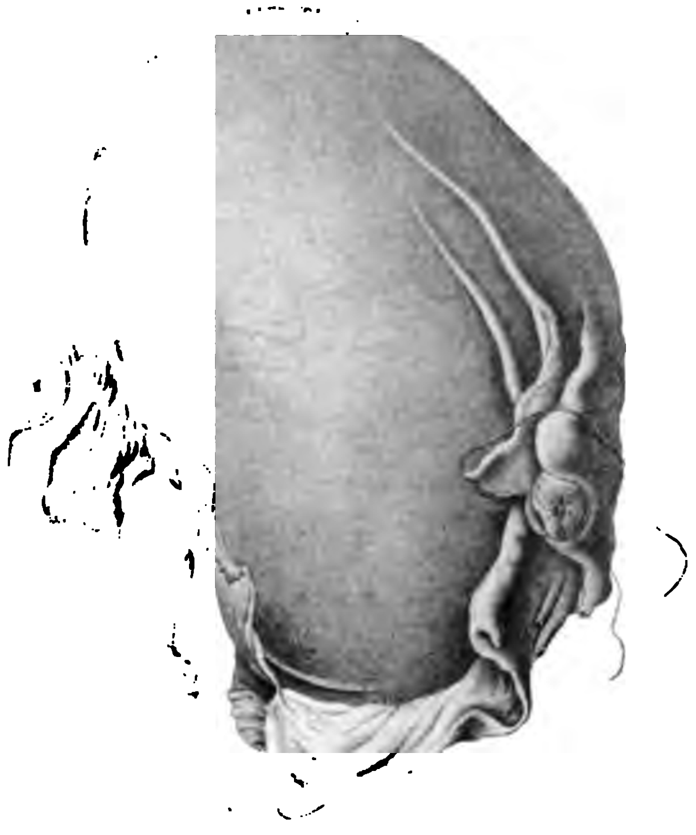
Cases Not Yielding to Replacement.—It is a rare experience to meet with cases of retroversion in pregnancy which do not yield to the treatment just described or to some treatment conducted upon similar principles. Very firm adhesions and fresh inflammation may so bind the pregnant uterus in the pelvis in a retroverted condition that it is impossible to restore it to its normal situation. In such cases there is nothing to be gained by the use of the tampon, while the pessary is useless and may be harmful. The physician's first duty with such a patient is to secure the reposition of the uterus without regard to the interests of the embryo; while the patient is anæsthetized to surgical anæsthesia, the tissues surrounding the uterus should be cautiously stretched and a very careful effort may be made to replace the womb. If only a little is gained in this procedure, the glycerin tampon should be thoroughly packed about the uterus and the patient's bowels thoroughly moved with salines during the following twenty-four hours.

If, however, no progress is made, it is the physician's duty to empty the uterus as soon as possible; this latter procedure is often a matter of considerable difficulty in these cases. Where adhesions are present the uterus is rarely retroverted alone, but is usually retroflexed as well. As a rule, by drawing down the posterior lip of the cervix, the cervix can be straightened sufficiently to permit the introduction of a small, solid dilator. When sufficient dilatation has been secured to permit the introduction of the finger, the embryo should be shelled out of the uterus by the finger. If the finger cannot reach, then the douche-curette may be employed to advantage. The uterus should be thoroughly irrigated with 2 per cent. lysol solution at a temperature of 110° F., and packed with iodoform gauze. If thorough antisepsis has been observed, and the procedure be conducted in a surgical manner, the patient should recover without complications.

The Removal of the Infected Uterus.—In cases of marked retroflexion, where the uterus is bound down by adhesions, and the patient is not seen until death and decomposition of the embryo have occurred, with beginning septic infection, it is sometimes necessary to treat the uterus as if it were a malignant focus and to remove it by extirpation. Where the uterus is not too large, vaginal extirpation, with the use of clamps or ligatures, is preferable in such a case. Where this is impossible, abdominal section and the ligation of the broad ligaments and removal of the uterus are indicated.

The Repair of the Supports of the Uterus During Pregnancy.—If a pregnant patient be found with the pelvic floor so lacerated that the supports of the uterus have been largely destroyed, great difficulty may be experienced in supporting the womb in a favorable position. The natural suggestion would be to restore the pelvic floor by a plastic operation; should this seem absolutely necessary, it does not at all follow that pregnancy would be interrupted by such a procedure. If the patient is in poor general condition by reason of her pregnancy, it is quite possible that an unsatisfactory union may follow such an operation. If, however, she is in good general condition, the operation may be performed if clearly required. Amputation of the cervix or closure of a torn cervix has been done during pregnancy without interrupting gestation. If the genital tract be thoroughly cleansed before the operation, and antiseptic precautions be observed, good union is usually procured.

FIG. 39.



Retroverted pregnant uterus, removed because incarcerated. (GOTTSCHALK.)

Myomata of the Uterus. Not a few women pass through pregnancy and labor having a myoma of the uterus whose presence is undetected. If the tumor is subperitoneal and small, and upon the posterior aspect of the womb, it readily escapes observation. If it be intramural and of small size, there is nothing to call attention to its presence. If it be submucous, the contractions of the uterus may extrude it into the cavity of the womb, where it may present in advance of the child; or it may be behind the child, and be discovered when the placenta is delivered. Large myomata greatly complicate pregnancy and labor by exposing the patient to the danger of severe hemorrhage, by preventing the descent and expulsion of the child and by the added risk of septic infection.

Pregnancy usually causes uterine myoma to increase rapidly in size. After labor such a tumor may undergo a partial involution with the uterus, while in some cases the tumor undergoes well-marked softening and fatty degeneration. The tissues of the uterus may be so changed that the womb may rupture. The frequency of myomatous tumors complicating pregnancy may be inferred from Hofmeier's researches.[99] In 11,073 patients, 550, or 4.3 per cent., had fibroid tumors of the womb. Of these 20.5 per cent. were unmarried and 73.5 per cent. married. Of those married, 26 per cent. had never been pregnant, and the average age of these patients was 40.5 years. Seventy-four per cent. of those married had been pregnant; an average of 3.6 per cent. of pregnancies had happened with each one; 25 per cent. were pregnant once only. From this and other researches we conclude that myoma of the uterus does not necessarily cause sterility, for it is rare to find a case in which sterility results from the presence of myoma alone. In most cases where sterility and myoma exist together, the causes which produce the sterility were active before the possibility of pregnancy occurred.

During pregnancy myomatous tumors of the womb occasionally become strangulated or impacted in the pelvis. Necrosis of the tumor and septic absorption follow. The diagnosis of fibroids of the uterus complicating pregnancy is made by palpation and vaginal examination, and also by the presence or absence of uterine pains and of pressure-symptoms, and œdema of the legs.

Treatment.—During pregnancy, if myomatous tumors of the uterus interfere with the rising of the womb into the abdomen and with its development during pregnancy, the tumors must be removed by myomectomy. This is possible in subserous tumors, in submucous tumors of moderate size which do not open the uterine cavity. The results of this treatment are usually satisfactory. Intramural tumors of small size and slow growth require no treatment during pregnancy, and submucous tumors cannot be treated unless the tumor presents before the child at the mouth of the uterus. If the ovum is firmly attached above the site of the myoma, the uterus will undergo considerable manipulation without the production of abortion. Cases are on record in which the pregnant uterus has partially expelled a submucous myoma, and in which its complete removal was made necessary by hemorrhage. The removal of the tumor and the tamponing of the uterus with gauze did not interrupt the pregnancy. In cases unsuitable for myomectomy, where the size and position of the tumor are such that spontaneous delivery would be impossible, hysterectomy is indicated. In cases where the tumor becomes infected during pregnancy, hysterectomy is the only treatment which offers promise of success.

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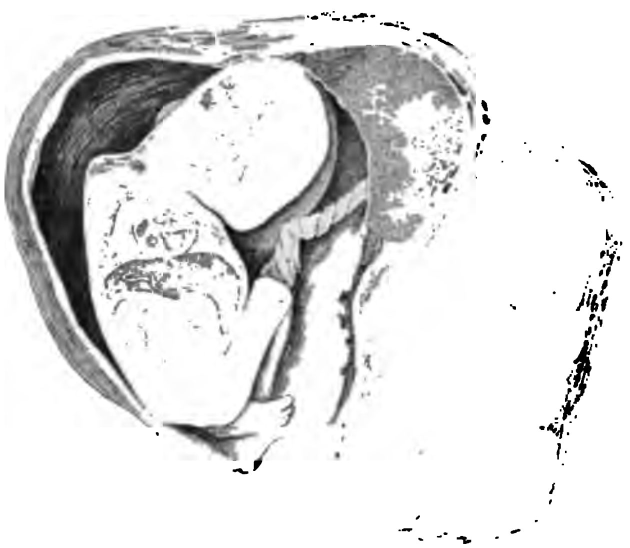
[99] Hofmeier: Zeitschrift für G. und G., Band 42, Heft 3, 1900.

Myomatous Tumors and Abortion.—Hofmeier does not believe that myomatous tumors exert a powerful influence in the production of abortion. Evidently the situation of the tumor has much to do with this result. If the uterus be free to rise from the pelvis into the abdominal cavity, abortion need not follow. Thus, intramural tumors, subperitoneal tumors, and small submucous tumors near the fundus do not necessarily produce abortion. Tumors so situated as to prevent the rising of the uterus and to make pressure constantly upon the womb often produce abortion.

FIG. 40.



Section through pregnant fibroid uterus and fœtus. (GÖRDES.)

The Mortality of Pregnancy and Parturition Complicated by Myoma of the Uterus.—Obstetric surgery has largely reduced the mortality formerly present in cases of pregnancy complicated by myoma of the uterus. During recent years the mortality of myomectomy in these cases has fallen to 11.75 per cent. (Staveley[100]), while Kelly[101] reports 97 operations, many of them myomectomies, with four deaths.

Cancer of the Uterus.—Unlike myomata of the uterus, malignant disease of the womb does not predispose to sterility. Hence the obstetrician will meet cases of pregnancy complicated by cancer, and the problem of giving mother and child the best chance for life presents itself for solution.

Carcinoma of the womb complicating pregnancy exhibits the usual

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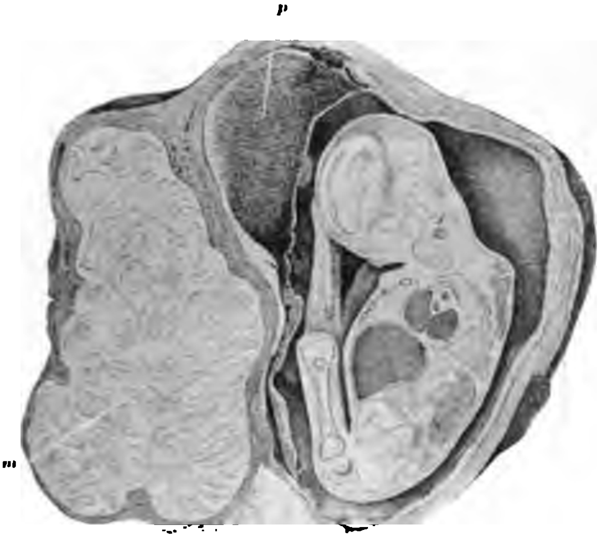
[100] Staveley: New York Journal of Gynecology and Obstetrics, 1894, June 5th.

[101] Kelly: American Gynecological Transactions, 1893.

phenomena seen in cancer. The malignant growth increases rapidly and spreads vigorously into the surrounding tissue. In cases not subjected to treatment, unless the womb is already extensively diseased before pregnancy begins, pregnancy will usually proceed to viability. As carcinoma commonly begins in the cervix, the cervix and lower uterine segment become extensively infiltrated, and also the tissue at the sides of the uterus. Labor is usually premature, because the capacity of the uterus is lessened and the fœtus cannot reach its normal development. An abundant vaginal discharge of blood and necrotic tissue is present, and the patient undergoes septic intoxication from the absorption from the uterus.

FIG. 41.



Section through pregnant fibroid uterus and fœtus. (GÖRDES.)
m. Myoma. p. Placenta.

Treatment.—If the diagnosis of carcinoma can be made in early pregnancy, vaginal extirpation of the uterus is indicated. Olshausen[102] reports 25 cases without a death in which the uterus was removed in early pregnancy, or in later pregnancy, after the fœtus had been expelled. The general mortality of extirpation of the cancerous womb is given by Winter.[103] In vaginal extirpation 10 per cent. of cases were practically cured; in other cases the apparent cure rises to 15 or 20 per cent.

If a doubt arises regarding the diagnosis of the condition in early pregnancy, the foreign growth being limited to the cervix only, the wishes of the parents may be consulted. If the mother prefers to take the risk, she may be allowed to go to a period of viability, and operation then performed through the abdomen or the child delivered by induced labor and the uterus removed by vaginal operation. She must, however, understand the risk which such a course entails, and must willingly elect to undergo this risk. Our present knowledge does not indicate that a physician is justified in urging a patient to go on in pregnancy with a suspicious growth in the cervix. The safer rule is that of Olshausen, to promptly remove the uterus unopened in all such cases.

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[102] Ohlhausen: Centralblatt für Gynäkologie. No. 17, 1897.
[103] Winter: Zeitschrift für G. und G., Band 43, Heft 3, 1900.

Complications.—A patient in this condition should not be allowed to go into vigorous spontaneous labor. Rupture of the uterus has occurred, with fatal result to mother and child. If dilatation is slow, the cervix may be freely incised and the child delivered by version or forceps. The emptying of the womb should be followed as soon as possible by its complete removal to avoid danger of septic infection.

Epithelioma of the Cervix.—Where epithelioma attacks the cervix during pregnancy, the foreign growth should be thoroughly and promptly removed throughout its entire extent. The diagnosis having been made by microscopic examination, good results may be hoped for if extirpation of the diseased mass be prompt and thorough. In apparently unfavorable cases, where the malignant growth has extended to the vaginal walls, a long interruption in its progress and occasionally its disappearance have been observed after removal. On the contrary, cases not submitted to treatment invariably go on to a rapidly fatal issue.

Sarcoma of the Decidua.--There can be no reasonable question but that sarcoma may attack the decidual lining of the uterus. It manifests itself by foul, persistent vaginal discharge, with hemorrhage occurring after labor and with abundant metastatic deposits in various portions of the body. A fatal termination usually occurs in six or seven months after the delivery of the patient.

Syncytioma Malignum — Deciduoma Malignum — Chorio-Epithelioma of the Uterus. — Under this name pathologists describe malignant growth originating in the ovum or its appendages, usually in the chorion, and involving the uterus and surrounding tissues with metastases in the various organs of the body. This disease is often associated with blighting of the impregnated ovum, and hence a history of the blighting of an ovum should put one on his guard in searching for this disorder. Uterine polyps have also been observed preceding the development of this condition. Hydatid disease of the ovum has also preceded the development of malignant growth.

Mode of Development. While opinions differ, the majority of observers believe that the syncytial cells found within the uterus and upon the villi of the chorion are the essential elements of this growth. In some cases these cells carried into the blood current of the body establish metastases in organs remote from the uterus. The writer, with Dr. H. F. Harris,[104] reported the case of a multipara with pernicious nausea of pregnancy. Other treatment failing, the ovum was removed. The patient then became almost maniacal, and perished of exhaustion. Post-mortem examination revealed syncytial growths in the liver, lungs, kidneys, and brain. The uterus had escaped involvement. In the abundant literature of the subject Marchand's papers[105] may be read with advantage, and Peters' monograph[106] will give the reader the best idea of the mode of development of this interesting condition.

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[104] Davis and Harris: American Journal of Obstetrics, July, 1900.

Diagnosis and Treatment.—The diagnosis of this condition is made by blighting of the ovum, symmetrical enlargement of the womb, with persistent foul discharge and emaciation and fever in the patient. The uterus should be immediately extirpated so soon as the diagnosis can reasonably be made. Curetting is not indicated, for it does not remove the source of the disease. Unfortunately, the prognosis is exceedingly grave, even when the uterus is promptly removed. The patient commonly perishes from metastases within a few months.

It is questionable whether, in the present state of our knowledge, anything can be done to diminish the risk of this disease. Certainly, no fragment of the ovum should be left within the uterus after abortion, and all cases of abortion and endometritis should receive thorough attention. At present this is the best suggestion afforded by our knowledge.

Endometritis During Pregnancy.—This condition usually results from an aggravation of a pre-existing inflammatory state, and is a frequent cause of early abortion. Should pregnancy continue, the membranes may become adherent about the internal os, thus making dilatation more prolonged and difficult. The placenta may also become adherent through this cause, and discharge of mucus or pus from the uterus is usually present in these cases.

Treatment.—This must be conducted in the interests of the mother only, as the condition, if well established, renders it unlikely that the pregnancy will go to full term. If the mother has fever, foul discharge, and other evidence of infection, the uterus should be dilated and thoroughly emptied. Drainage with gauze is indicated in these cases, and should infection of the pelvic tissues arise, incision of the posterior vaginal vault, with gauze drainage, should be practised. Diseased tissues should be thoroughly removed from the uterus with the curette.

Infection of the Decidua and Fœtal Membranes Occurring During Pregnancy.—Many cases in which a discharge of mucus and pus persists from the uterus during pregnancy can be explained by the occurrence of infection in the decidua and fœtal membranes. The discharges resemble those described in cases of hydrorrhœa gravidarum, and it may not be possible to distinguish between the two. Amniotic liquid often escapes in these cases, because the membranes are adherent at the internal os and rupture partially before active

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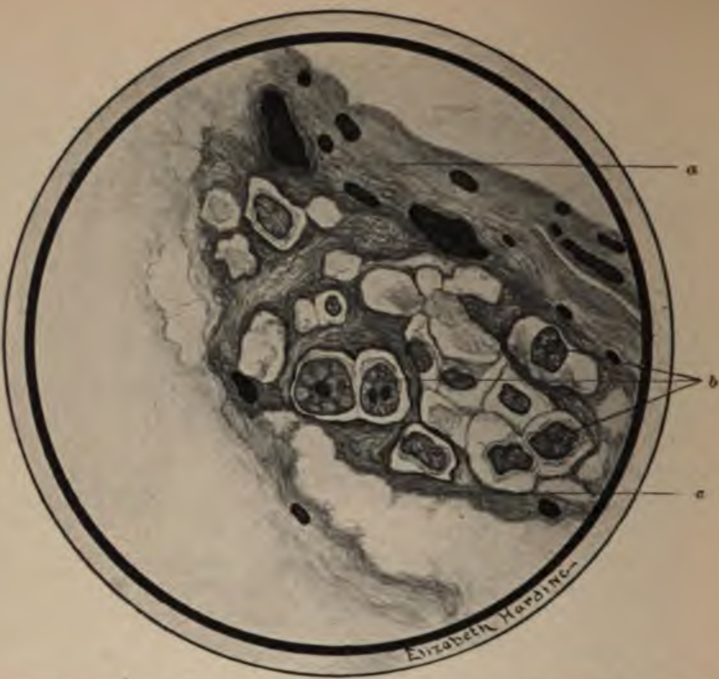
[105] Marchand: Zeitschrift für G. und G., Bd. 38 and 39, 1898.

[106] Peters: Die Einbettung des menschlichen Eies, Leipzig und Wien, 1899.

FIG. 42.

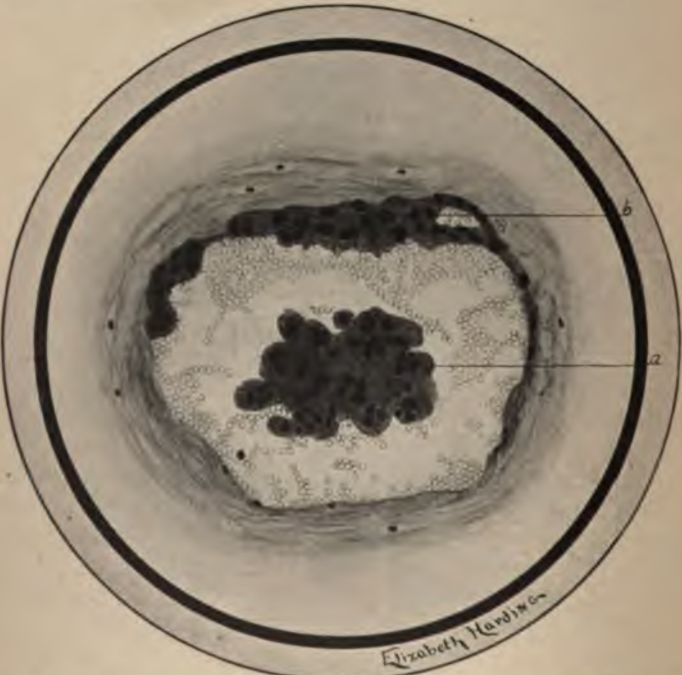


Syncytioma malignum, author's case. Specimen from the tumor of the kidney, highly magnified. The tissue was fixed in the mercuric chloride solution of Heidenhain, embedded in paraffin and stained by the method of Van Gieson. Zeiss b eye-piece and $\frac{1}{12}$ inch oil immersion objective.

(*a*) Outer layer of syncytium; (*b*) inner layer, containing the cells of Langhans.

(From original drawing.)

FIG. 43.

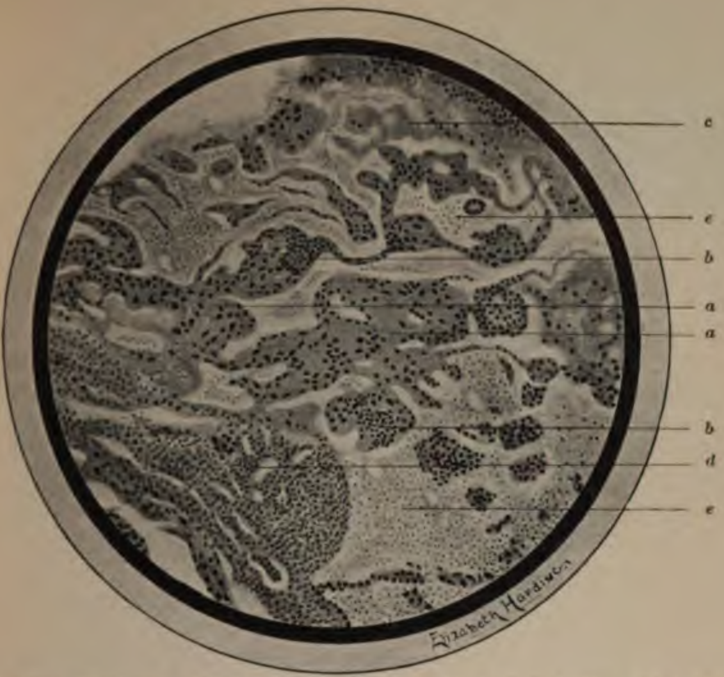


Syncytioma malignum, author's case. Section from one of the smaller branches of the pulmonary artery. The tissue was fixed in the mercuric chloride solution of Heidenhain, embedded in paraffin and stained in hæmalum and eosin. Bausch & Lomb 1 inch eye-piece and $\frac{1}{6}$ objective.

(*a*) Syncytial mass in the center of the vessel; (*b*) syncytial mass penetrating the wall of the artery.

(From original drawing.)

FIG. 44.

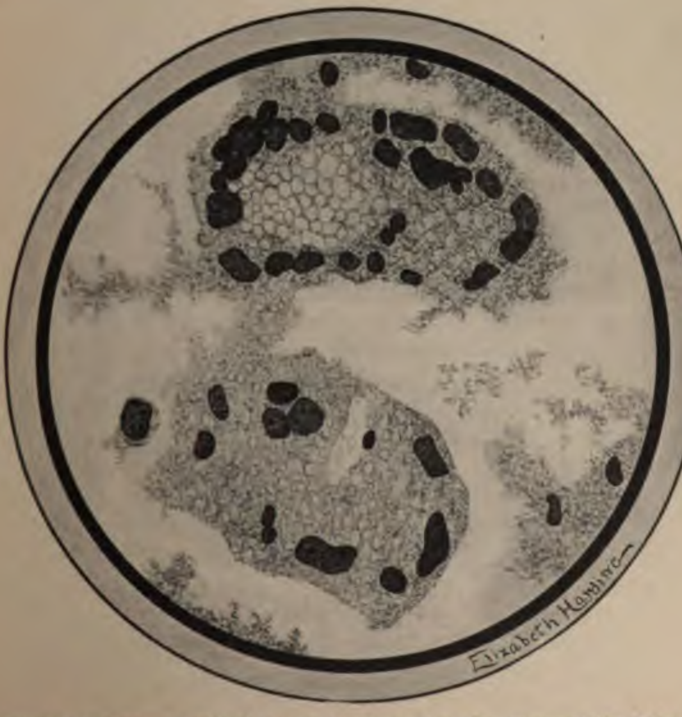


Syncytioma malignum, author's case. Section of the tumor of the kidney. The specimen was fixed in the mercuric chloride solution of Heidenhain, embedded in paraffin and stained in the mixture of Van Gieson. Bausch & Lomb 1 inch eye-piece and $\frac{2}{3}$ inch objective.

(*a*) Syncytial masses containing Langhans' cells at *b*; (*c*) syncytial masses, the nuclei of which have disappeared; (*d*) syncytial masses infiltrated with leucocytes; (*e*) intervillous spaces filled with disintegrating blood.

(From original drawing.)

FIG. 45.



Syncytioma malignum, author's case. Specimen from the tumor of the kidney; highly magnified. The tissue was fixed in the mercuric chloride solution of Heidenhain, embedded in paraffin, and stained by the method of Van Gieson. Zeiss "b" eye-piece and $\frac{1}{12}$ inch oil immersion objective.

(From original drawing.)

labor begins. In a case reported by the writer the diagnosis was made during pregnancy, and the patient kept under observation. Spontaneous labor occurred, the mother's recovery being complicated by moderate rise of temperature and by a foul and profuse uterine discharge. These subsided under uterine irrigation with antiseptic fluid. The placenta was large, soft, boggy, and friable, and the chorion thick, opaque, and friable. Microscopic examination showed suppurative inflammation of the chorion. Abundant leucocytes were present, with a diplococcus.

Salpingitis Complicating Pregnancy.—Salpingitis may exist and pus form in the Fallopian tube during pregnancy without giving sign of this condition. If adhesions be present between the uterus and the tubes, pain and discomfort will be felt as the uterus rises from the pelvis into the abdomen. If adhesions be firm, it may be impossible for the uterus to normally develop, and abortion may be the result. Retroversion and retroflexion of the pregnant uterus may be caused by the adhesions complicating salpingitis during pregnancy. The diagnosis of pyosalpinx complicating pregnancy may be impossible. A case came under the observation of the writer in which a patient went through an apparently normal pregnancy. When labor came on, it was necessary to deliver her by Cæsarian section. It was then found that a large pyosalpinx upon one side was present, and this was successfully removed after the uterus had been closed. The patient made a good recovery. Danger exists in these cases that acute septic infection will develop after the patient has passed through her labor. For this reason patients having salpingitis should avoid pregnancy until the condition has been remedied.

Ovarian Disease Complicating Pregnancy.—While the Fallopian tubes undergo hypertrophy during pregnancy, investigation shows that the ovary is not enlarged. Acute oophoritis is a rare complication of pregnancy, and is usually the result of an exacerbation of a chronic process or infection from previous abortion. Abdominal section in these cases gives the best results before the fifth month of pregnancy.

Ovarian Tumors Complicating Pregnancy.—The presence of an ovarian tumor during pregnancy exposes the patient to very considerable risk through the constant tendency to twisting of the pedicle and gangrene of the ovarian tumor. For this reason, as well as for the fact that the abdomen cannot accommodate a normally-developing uterus and a large ovarian tumor, ovarian tumors occurring in pregnant patients should be removed. In addition, the condition of pregnancy aggravates and increases the growth of the ovarian tumor, whatever its nature may be.

Treatment.—At the present time experienced investigators are agreed that the diagnosis of an ovarian tumor during pregnancy calls for its removal. During pregnancy the patient is exposed to the dangers already described, and during labor an ovarian tumor may prevent the expulsion of the child; or if it does not, the tumor usually receives such bruising and injury during labor that it undergoes necrosis afterward and exposes the patient to the danger of septic absorption. The uterus has ruptured during labor in a patient having an ovarian tumor. Occasionally the ovarian tumor is forced through the vagina or through the rectum. Formerly the suggestion has been made that an ovarian tumor complicating pregnancy may be tapped, or that it should be pushed upward in the abdomen, allowing the child to descend and to be delivered. Neither of these procedures is accepted at present.

The results of ovariotomy during pregnancy justify the decision for operation. Fehling[107] reports 266 abdominal sections for ovarian tumors complicating pregnancy, with a mortality of 5.4 per cent. This closely approaches the mortality rate of ovariotomy in non-pregnant patients. Thirty-three per cent. of the children were lost through abortion or premature labor. Engstrom[108] collected 48 ovariatomies during pregnancy, with two deaths. Double ovariotomy may be performed successfully, as shown by Mainzer[109].

Disorders of the Vulva: Hæmatoma.—The engorged and congested condition of the vulva during pregnancy especially favors the occurrence of disease or injury to this part. Hæmatoma is readily caused by mechanical violence. It should be treated by rest, scrupulous cleanliness, with pressure made by sterile gauze. If absorption proceeds slowly and imperfectly, the hæmatoma should be incised under antiseptic precautions, and the sac tamponed with iodoform-gauze.

Pruritus.—Pregnant patients are sometimes excessively annoyed by obstinate itching and burning of the vulva. In some cases this is associated with the presence of sugar in the urine, and in others a gouty diathesis can be recognized. In treating these cases it is first necessary to know positively that very strict and thorough cleanliness is practised. The secretions of the skin in these cases may undergo decomposition and become excessively irritating. In many cases the trouble disappears when these disordered secretions are removed. The patient's general condition should also receive attention. Errors in nutrition must be corrected, anæmia must be treated, and highly neurotic conditions must be recognized and given proper attention. When this has been done, local applications must be used. Antiseptic solutions should first be tried to destroy germs which may be keeping up irritation and inflammation. Counter-irritants in mild solution may be employed, and anodyne preparations, as cocaine, belladonna, or opium. Treatment by local applications is not especially successful or satisfactory. In extreme cases it may be necessary to remove some of the tissue from which the greatest irritation proceeds. It is possible to remove the entire vulva, covering the surface left by a plastic operation.

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[107] Fehling: Monatsschrift für G. und G., Bd. 12, Heft 4, 1900.
[108] Engström: Annales de Gynecologie, October and November, 1890.
[109] Mainzer: Münchener medicinische Wochenschrift, No. 48, 1895.

TREATMENT.—In cases of obstinate pruritus an examination of the urine will often assist greatly in arriving at a diagnosis. Sugar and acetone are the substances most frequently found in these cases. The tests for the former usually employed may be used, attention being called to the fermentation-test, which is used as follows: Four ounces of the suspected urine are put in a twelve-ounce bottle, to which is added a piece of compressed yeast the size of a small walnut. A cork with a small nick in it is employed to close the bottle and to permit the escape of carbonic-acid gas. A tightly corked four-ounce bottle filled with the same urine, but with yeast, is placed beside the first, and both are allowed to remain in a warm place for eighteen to twenty-four hours. Fermentation will then be complete, and the urine will have become clear. The specific gravity of the fermented urine is compared with that of the unfermented, and the percentage of sugar present estimated by multiplying the number of degrees of specific gravity lost by the fraction $\frac{23}{100}$. Attention is also called to the bismuth-test, which depends for its efficiency upon the fact that sugar possesses the power of reducing the salts of bismuth, and, if present, that black metallic bismuth will be deposited. Tests by picric acid and by phenyl-hydrazin are both used for small amounts of sugar.

For acetone, the suspected urine is first made alkaline by *liquor potassæ*. A few drops of fresh, strong solution of sodium nitro-prusside are then added, when a distinct red color is developed. This red color gradually disappears; but if acetone be present a few drops of concentrated acid brings out a purple or violet-red. If acetone is absent, this change does not occur.

It is often possible to modify the composition of the urine sufficiently to reduce or entirely obviate the irritation which it causes upon the tissues affected by pruritus. The urine may be diluted by causing the patient to drink freely of water, and especially of faintly alkaline water. The administration of dilute acids in the form of lemonade is also indicated in many cases. The administration of boracic acid may be conveniently accomplished by the use of disks of rice-flour, known as wafers or conseals. Five or ten grains of boracic acid may be given in this way conveniently. In some cases the administration of dilute hydrochloric acid at mealtime will result in a better digestion and diminish the quantity of irritating material which the urine contains. Where the urine gives evidence that catarrh of the bladder or cystitis is present, the bladder should be thoroughly irrigated once daily with creolin, ½ per cent., or with a solution of sodium biborate, ten grains to the ounce. The avoidance of spices and condiments in the diet is also a useful precaution if the orifice of the urethra and vaginal tissues are very much inflamed. In other cases tonics are indicated to improve the general health. The following formulæ have been found useful by Stelwagon in the local treatment of this condition:

Acid. carbolici	ʒj–ʒiij.
Glycerin	ʒij.
Alcohol	℥j.
Aquæ	q. s. ad Oj.

Same as above, with one to three drachms of resorcin added or replacing the carbolic acid.

Liquor carbonis detergens, of varying strength, from one to two teaspoonfuls in a teacupful of water up to the pure solution.

Menthol, five to ten grains to the ounce of liquid petrolatum or cold cream.

Thymol, five to ten grains to the ounce of liquid petrolatum or cold cream.

Cocaine, one to ten grains, in solution or ointment.

A half to one drachm each of camphor and chloral to the ounce of ointment.

Hot-water sponging or steaming as a temporary measure of relief.

In cases due to irritating discharges, astringent applications and injections of alum, tannic acid, zinc sulphate; also hot-water injections.

Where no general cause can be ascertained for the disorder, various antiseptics and anæsthetic applications are indicated. Such are carbolic acid, nitrate of silver, alkaline douches, starch poultices, laudanum and lead-water, the application of the galvanic current, and sitz-baths of varying degrees of heat or cold. A complete cure must not be expected in an obstinate case of this sort, and the most that can be done is to palliate until the termination of pregnancy shall remove the cause.

Elephantiasis of the Vulva.—This condition may be seen during pregnancy, and in extreme cases the enlargement may become so great as to interfere with the delivery of the child. These cases are independent of venereal disease, and there seems to be no definitely recognized cause for the condition. During pregnancy it is best not to attempt removal unless the tissue increases greatly in size. At labor the parts must be kept thoroughly aseptic and clean, and care should be taken to avoid bruising or wounding the tissues, as hemorrhage may result. When the patient has recovered from labor, the enlarged tissue should be removed by amputation.

The Presence of Bacteria in the Genital Tract.—Many investigations have been made to determine the presence or absence of bacteria in the genital tract of the healthy pregnant patient. The results of these studies have been apparently conflicting, but the discrepancy is more apparent than real. It may reasonably be explained by differences in technique and methods employed in obtaining the discharges from the different parts of the genital tract. When due allowance has been made for these factors, the conclusion is reached that actively pathogenic bacteria do not exist in the genital canal of the healthy patient before labor. Hence vaginal examinations may be a means of infection, and vaginal douches before labor are not only not indicated, but may be harmful.[110] Bacteria are found within the genital canal before labor, but they are, as has been stated, not pathogenic. In addition to this fact, the genital canal is protected against the invasion of bacteria by its mucous membrane, and also by the secretion of this membrane and its glands. This secretion is not only protective mechanically as a lubricant, but is also germicidal to considerable extent. Experiment has shown that cultures of pathogenic bacteria introduced within the vagina of a healthy pregnant patient not only do not increase, but are killed by the acid vaginal secretion present in these cases. (Plates X and XI.)

Practical Inferences to be Drawn from the Bacteriological Examination of the Genital Tract—The importance of aseptic and antiseptic precautions in dealing with pregnant and parturient patients receives positive emphasis from the result of bacteriological investigation. In addition to this fact, it is evident that the genital tract in a healthy patient should be disturbed as little as possible during pregnancy and parturition. The natural and aseptic secretions of this portion of the body should not be altered by douching, nor should the mucous membrane be lacerated or bruised by frequent examinations or by forcible manipulation. Through wounded surfaces infective bacteria readily enter, and even non-pathogenic bacteria may become active when introduced within the lymphatics. If conditions arise which lead the physician to believe that the vagina and womb have become infected, he should not endeavor to overcome this condition by repeated douching. This procedure tends to carry septic bacteria into the cavity of the uterus, although the douche may be given in the vagina only. The genital tract should be antiseptically cleansed, but this should be done once thoroughly, and after that manipulation should be avoided.

Spontaneous Rupture of the Uterus.—While it is true that in many cases rupture of the uterus occurs during labor, this accident may still happen in pregnancy and spontaneously.

Causes.—The immediate cause of this accident is the intermittent uterine contractions, which are one of the cardinal phenomena of pregnancy. A most important predisposing cause is some alteration in the structure or position of the uterus, which makes its walls unable

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[110] Among the papers upon this subject which may be consulted by those who desire to extensively study the subject are those of

Winter: Zeitschrift für Geburtshülfe und Gynäkologie, Band 14, Heft 2.

Williams: American Journal of Obstetrics, December, 1898.

Hofmeier: Deutsche medicinische Wochenschrift, 1891; Berliner klinische Wochenschrift, 1898, No. 46.

Krönig: Münchener medicinische Wochenschrift, 1900, No. 1.

Walthard: Archiv für Gynäkologie, Band 48, Heft 2.

Menge und Krönig: Die Bacteriologie des weiblichen Genital-Kanals, Leipzig, 1897; also, Centralblatt für Gynäkologie, 1900, No. 5.

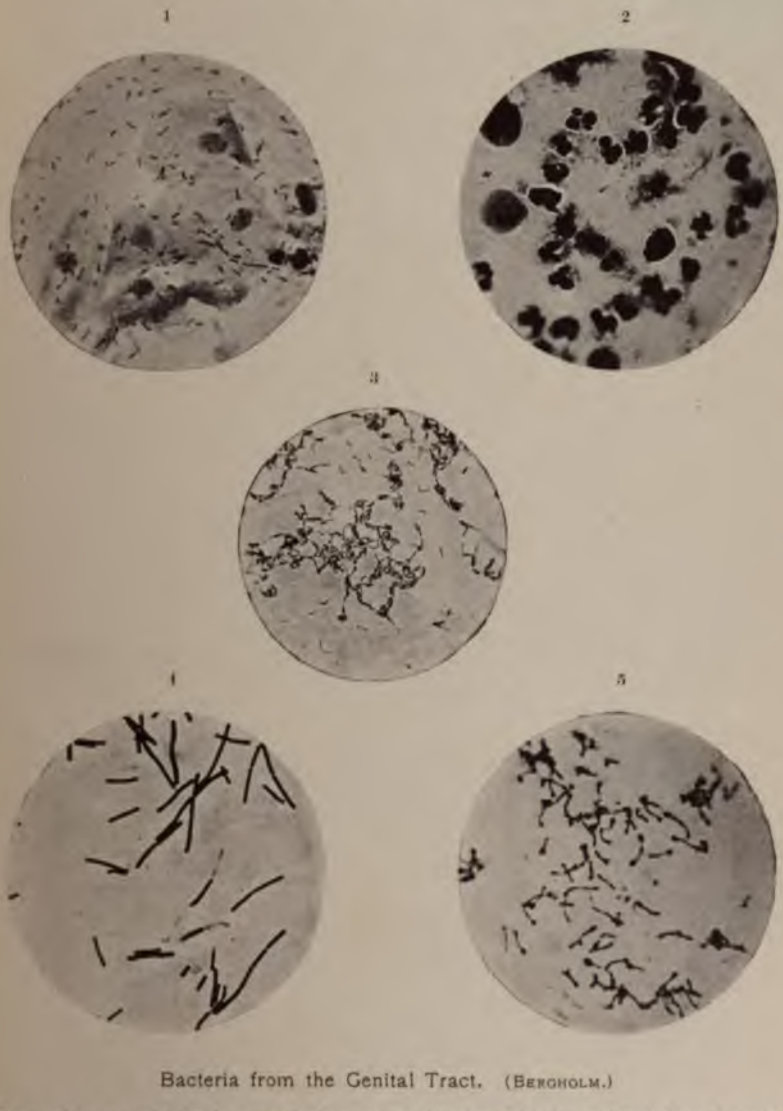
Döderlein: Das Scheidensecret und seine Bedeutung für das Puerperalfieber, Leipzig, 1892.

Friedrich: Centralblatt für Chirurgie, 1899, No. 27.

Kettmann: Archiv für Gynäkologie, Band 55, Heft 3, 1898.

Sticher: Zeitschrift für Geburtshülfe und Gynäkologie, 1900, Band 44, Heft 1.

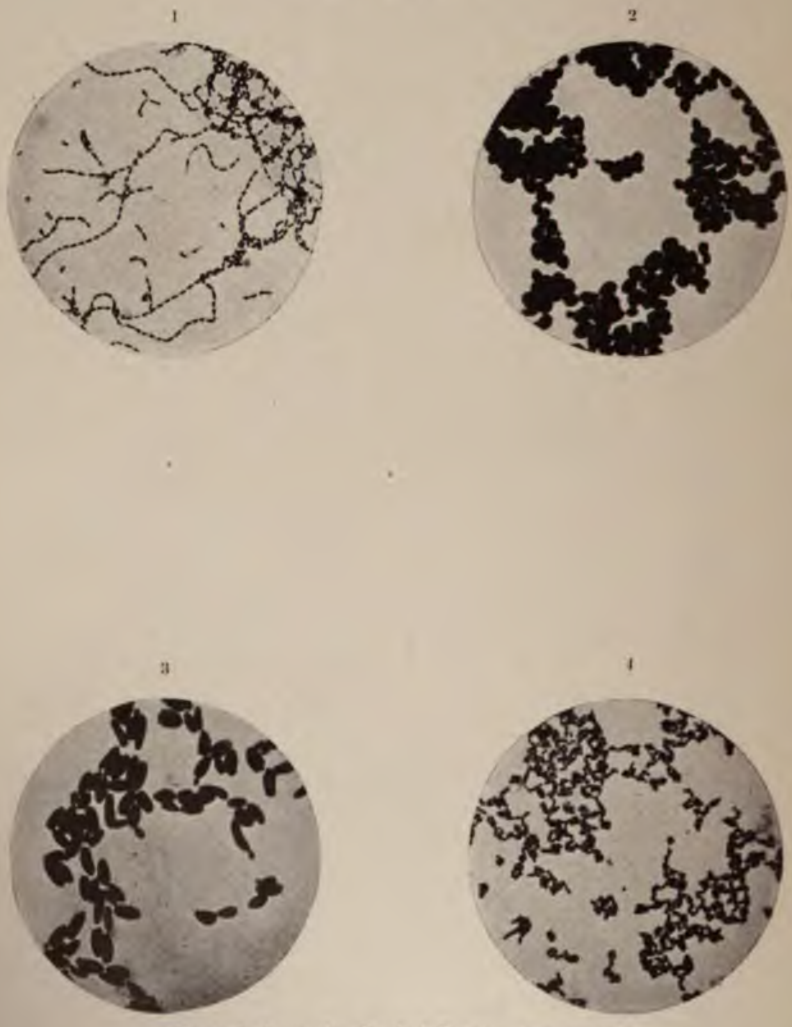
PLATE X.



Bacteria from the Genital Tract. (Bergholm.)

1. Cover-glass preparation from vaginal secretion, showing epithelia with rod-shaped bacteria.
2. Cover-glass preparation, showing abundant leukocytes, flattened epithelial cells and abundant, short, rod-shaped bacteria arranged in chains.
3. Rod-shaped bacteria after twenty-four hours' growth on agar.
4. Rod-shaped bacteria after twenty-four hours' growth in bouillon.
5. Rod-shaped bacteria after twenty-four hours' anaerobic culture in neutral grape sugar agar in ascitic fluid.

PLATE XI.



Bacteria from the Genital Tract. (BERGHOLM.)

1. **Streptococcus after twenty-four hours' growth on grape sugar bouillon with admission of air.**
2. **Ordinary ovoidal fungi after twenty-four hours' growth on alkaline agar.**
3. **Oval elongated and pointed fungi after twenty-four hours' growth on alkaline agar.**
4. **Rod-shaped bacteria after twenty-four hours' growth on blood serum.**

to withstand contractions of the uterine muscle. Thus a myomatous tumor in the pregnant womb predisposes to rupture, while displacements of the uterus, with adhesions binding the womb in an abnormal position, have a like tendency. Fatty degeneration of the uterine muscle and the rapid development of a large fœtus naturally result in rupture. Direct violence of the uterus by manipulation or by external impact through accident may cause uterine rupture. The rude manipulation of the criminal abortionist has often ruptured the uterus. Pregnant women falling upon a hard surface or receiving blows or kicks of the abdomen have had the uterus ruptured as a consequence. The fact that placenta prævia predisposes to rupture of the uterus is familiar to all obstetricians. Experience shows that neither pelvic contraction nor abnormal position of the fœtus is necessary for uterine rupture.

Complications.—The immediate effect of uterine rupture in the pregnant woman is the extrusion of a portion of the contents of the womb into the pelvic or abdominal cavity. In debilitated patients very little pain accompanies the actual rupture of the uterine muscle. As the contents of the uterus are in themselves sterile, they must undergo death and decomposition before reaction follows their escape: hence, for twenty-four or thirty-six hours after the womb has ruptured but little or no result is seen. Gradually, however, symptoms of septic infection, with reactionary inflammation, develop, and the physician is soon aware that his patient is contending with septic infection. In cases where the womb is ruptured during pregnancy by the sound of a criminal abortionist, septic infection usually accompanies rupture, as these criminals are frequently not aseptic in their manipulation.

Diagnosis.—In any pregnant woman who sustains a fall or blow, causing violence to the abdomen, rupture of the uterus may be suspected. An examination of such a patient might give no sign of uterine rupture immediately after its occurrence if the rupture is slight. If, however, the uterus is torn completely across and the finger can be passed through the cervix, the rent will be discovered, and in some cases the mother's intestine might be detected prolapsed into the uterus. The gradual development of abdominal symptoms pointing to septic infection in a pregnant woman who had sustained violence should lead the physician to suspect rupture of the uterus.

Treatment.—In early pregnancy, before viability, the interests of the fœtus are naturally disregarded. After viability, in exceptional cases only is any opportunity given to consider the claims of fœtal life. So invariably is the accident fatal to the child that, in the interests of the mother, no delay should be practised in endeavoring to save it.

The treatment of this condition consists in emptying the uterus in that manner which will do the least violence to the patient. If the womb can be emptied through the vagina without enlarging the rupture and subjecting the patient to hemorrhage and shock, this should be done. But if doubt exists regarding the success of this method, the abdomen should be opened. More cases will be successfully dealt with by opening the abdomen than by manipulation through the vagina.

If the operator proceeds by the vaginal method, the uterus is emptied, care being taken not to introduce fluid within the womb, but to cleanse its cavity thoroughly with aseptic gauze. A strand of aseptic gauze is then carried through the rent in the uterus into the pelvic or abdominal cavity to serve as a drain. Under antiseptic precautions, this method has given a considerable percentage of success. Antiseptic dressings are applied over the vulva, and the patient is kept as clean as possible.

In early pregnancy, if the operator cannot readily empty the uterus and drain it, it may be removed through the vagina, performing vaginal hysterectomy in the usual manner. If the uterus is too large to permit this, abdominal section should be practised. When the fœtus and its appendages have been removed and the uterus emptied and disinfected, the operator must consider the possibility of stitching the uterine wall, and thus saving this organ. It must be remembered that extensive tears extending transversely across the uterus are not favorable cases for suture, and under such circumstances the womb should be removed. Supra-vaginal hysterectomy, with intra-peritoneal treatment of the stump, is usually practised in these cases. Where, however, the rent is small, extending longitudinally or obliquely, and is capable of accurate closure by suture, the operator may endeavor to save the uterus. Such is the danger of septic infection that he should drain after such an operation, either opening the posterior cul-de-sac and draining into the vagina or draining by strands of gauze upward to the lower end of the abdominal incision.

Peritonitis Complicating Pregnancy.—It is evident that in cases in which pyosalpinx or pelvic abscess complicates pregnancy a focus of infection is present, which may readily set up peritonitis should the boundary of the abscess be broken down. Previous inflammation of the endometrium, the Fallopian tubes, or connective tissue of the pelvis may leave behind it a nidus, which the traumatism of labor may so disturb as to set up acute infection. If the child is delivered in such a way that septic matter is not set free, the patient may pass through pregnancy and labor without the fact of previous infection becoming known. In a case under the observation of the writer, a colored woman having a contracted pelvis was apparently in excellent condition during pregnancy, without signs of pelvic complications. The contraction of the pelvis necessitated Cæsarian section, and upon opening the abdomen a large pyosalpinx was found, communicating by a small opening with the intestine. This opening had evidently afforded sufficient drainage to prevent distention and rupture of the pyosalpinx, although the opening was not sufficiently large to efficiently drain the abscess. The pyosalpinx was removed, the patient making a good recovery.

Many cases of peritonitis complicating pregnancy arise without assignable cause, so far as infection is concerned. A mechanical injury or severe strain may be followed by extravasation of lymph upon the peritoneum, and the formation of pus with general peritonitis. In some cases of extensive traumatism blood may be freely extravasated from ruptured viscera. A case is reported in which a pregnant patient slipped through a hole in the floor of a building, severely bruising the abdomen and causing peritonitis, which proved rapidly fatal, diagnosis being made by abdominal section. There was no evidence of rupture of the uterus or other abdominal organ, nor was a focus found within the abdomen from which an inflammation could have proceeded. Another pregnant patient fell over the back of a chair, severely bruising her left side. Fatal general peritonitis followed. Upon autopsy, soft and purulent lymph was present upon the peritoneum and pleuræ. This was found in great abundance over the tubes and ovaries. There was no rupture of any pelvic or abdominal organ. Other cases are reported in which peritonitis followed a blow upon the abdomen or the taking of drugs to produce abortion. Cases are occasionally seen in which the ingestion of a large quantity of very cold liquid while the patient is overheated has been followed by the development of peritonitis. The most rational explanation for these cases lies in the formation of ferment, caused by the mechanical injury and death of abdominal tissue or by the extravasation, following violence, of bacteria or their products from the digestive tract.

Treatment.—So far as the treatment of peritonitis complicating pregnancy is concerned, if the case can be seen early, abdominal section is certainly indicated in the hope that a focus of infection may be found, whose removal may be followed by recovery. It is questionable whether douching the entire peritoneal sac with salt solution, and inserting drainage tubes or wicks of gauze, offers prospect of recovery. The attempt, however, should be made. In the event of general peritonitis, causing a rapidly fatal issue, it may be necessary to perform post-mortem Cæsarian section at the moment of death in the interests of the child.

CHAPTER XV.

DISORDERS OF THE BLOOD AND OF THE ORGANS OF CIRCULATION.

Abnormal Conditions of the Blood.—In many patients the impaired nutrition, caused by nausea and vomiting, brings about a condition of anæmia, which lasts during the early months of pregnancy. Under ordinary circumstances this should give place to physiological plethora during the later months. It has been shown by many investigators that so soon as the patient's nutrition becomes established the corpuscles of the blood increase, and the amount of hæmoglobin is very markedly augmented. The specific gravity of the blood during pregnancy is about 1,025. The percentage of fibrin increases, while, as pregnancy advances, the quantity of cells and of hæmoglobin may become relatively diminished. There can be no doubt but that anæmia in pregnancy is a distinctly pathological condition, and one demanding attention.

Anæmia.—Pregnant patients are made anæmic by the same causes which bring about the condition in the non-pregnant. The same methods of examination and diagnosis are available in the pregnant that are employed in the non-pregnant. It is a curious historic fact that so recently as 1871 a malpractice suit was reported to the Obstetrical Society of London, in which a physician was sued for using ammoniocitrate of iron in the treatment of anæmia in a pregnant patient. It was thought dangerous to employ this remedy lest it might cause abortion.

Observation shows that the eighth month of gestation is the period at which anæmia develops in a severe form. It is at this time that the weight of the fœtus should increase most rapidly, and hence that the mother's nutritive powers are most taxed. Leukemia is the form of anæmia most frequently observed, and often seen in patients with whom there is a family history of the condition. Cameron[111] reports a case of marked family history of leukemia. Sänger[112] describes the case of a leukemic mother who bore a healthy child, and also of a healthy mother who gave birth to a leukemic child. The writer[113] reports the case of a multigravida who had pernicious anæmia and hematogenic jaundice. The blood of the fœtus was found to be normal. The patient improved greatly after delivery, by appropriate treatment.

The fœtus does not suffer as much correspondingly in these cases as does the mother, because of its well-known ability to maintain itself at the mother's expense. A condition of anæmia or leukemia is serious for the mother, because it exposes her to important degenerations of the blood, to epistaxis, hematemesis, and melanemia, and makes her especially liable to the development of septic infection. A condition of rapidly increasing and pernicious anæmia would justify, in the failure of other treatment, the interruption of pregnancy.

Purpura Hemorrhagica. — This grave condition is especially severe in pregnant women, probably because of the nervous relation of the skin of the body to the genital organs, an example of which is seen in the eruptions which often accompany disorders of menstruation. Purpura occurs in pregnant women independent of family history or previous condition. The previous history of hemophilia is often lacking in these patients. In some cases deprivation and hard work have increased the disorder, and profound emotion has been seen in some patients. An effort has been made to show that this disorder is produced by infection by bacilli, but the evidence is not sufficiently strong to warrant a positive conclusion. Examination of the mother's blood during the height of the attack showed granular masses of dark color in the corpuscles, which increased as the disorder became severe and diminished as the patient recovered. Early in the disease the number of red corpuscles was not much diminished, although later the red cells were greatly lessened. The white cells increased rapidly, while the percentage of hæmoglobin was as low as 30, afterward rising.

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[111] Cameron: Amer. Journ. Med. Sciences, Jan. 1888, Nov., 1890.
[112] Sänger: Archiv für Gynækologie, Band 33, Heft 2.
[113] Davis: Trans. American Gynecological Society, 1891, Vol. 16.

The Treatment of Disorders of the Blood Complicating Pregnancy.—Anæmia and leukemia during the pregnant condition should be treated by the same methods which are successful in the non-pregnant. The patient should be made to eliminate thoroughly, as a matter of primary importance, in these cases. Osler[114] obtained good results from the continued use of arsenic and treatment addressed to gastro-intestinal catarrh. Iron may be given freely; oxygen should be used, and the patient should be fed as persistently and carefully as possible. All means should be taken to preserve her strength. In purpura, oozing surfaces should be treated, if possible, with sterile dressing, and care must be taken to avoid the use of bichloride of mercury as an antiseptic, because of the danger of poisoning by this substance, which is especially present in anæmic patients. A suspicion of syphilis calls for the internal administration of mercury. A thorough study of the blood will inform the physician of the presence of malarial intoxication and suggest proper treatment for its relief. Such patients require close watching, and should they fail to improve under vigorous treatment, pregnancy must be terminated before the patient has been allowed to pass into a hopeless condition. At labor these patients are especially prone to hemorrhage, and easily become septic if infected.

The Alkalinity of the Blood in Pregnancy.—Blumreich[115] finds that the alkalinity of the blood increases steadily throughout normal pregnancy. This condition is sometimes accompanied by a low specific gravity. It seems to be independent of the number or increase in the red corpuscles. After the birth of the child, the alkalinity of the blood steadily decreases.

Diseases of the Heart Complicating Pregnancy.—Among the most serious of the complications of pregnancy is cardiac disease. Its gravity may be understood by reviewing briefly the conditions which are present during pregnancy which affect the circulation. Fellner[116] and other observers have found that the hypertrophy of the ventricles occurring during pregnancy is but partial, and is accompanied by dilatation of the ventricles. We not infrequently find in pregnant women indications of relative insufficiency and murmurs caused by anæmia, or the disturbance of the heart following its unnatural position as the growing uterus disturbs the relative position of the different organs of the body. The tension of the blood during pregnancy is increased and greatly augmented by uterine contractions, and correspondingly lessened in the intervals between the pains of labor. The rupture of the fœtal membranes and the escape of amniotic liquid causes blood pressure to sink rapidly. The longer the pains continue the higher is the blood tension, its extreme point being reached at the moment when the head of the child is born. Immediately after labor blood tension falls much below the normal, especially if the uterus remains in its normal condition of contraction. The separation of the placenta temporarily lessens blood pressure, while hemorrhage during or after labor greatly reduces it. When delivery is effected by the use of instruments, there is less increase in blood pressure than during normal labor, while blood pressure falls more rapidly. When the mother nurses her child, blood pressure and the pulse rate rise and fall when nursing ceases. The fall in blood pressure after labor occurs through filling of the abdominal vessels, through compression of the uterus, through lessening in intrauterine tension, and from engorgement in the vessels of the lungs. The increased tension resulting from relaxation of the uterus after labor, which is a temporary phenomenon, is due to the action of the elastic muscular fibres of the arterial vessels, which, unlike the venous blood channels of the uterus, do not dilate.

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[114] **Osler: Boston Medical and Surgical Journal, November 8, 1888.**

[115] **Blumreich: Archiv für Gynækologie, 1899, Band 59, Heft 3.**

[116] **Fellner: Monatsschrift für Geburtshülfe und Gynækologie, Band 14, Heft 3, 1901.**

Causes.—Those who have studied the subject agree that there is something in the condition of pregnancy which favors the development of endocarditis. Undoubtedly the increased strain brought upon the heart by pregnancy is a factor in bringing about this result. Cases of endocarditis arising during pregnancy may follow an attack of acute rheumatism or any of the acute infections which attack a pregnant woman. It is, however, comparatively rare to see a case of endocarditis arising during pregnancy, and nearly all heart lesions which come under the observation of the obstetrician have their origin in an endocarditis developing during the childhood of the patient.

The Comparative Mortality of Different Forms of Heart Lesion Complicating Pregnancy.—Observers agree that mitral stenosis is by far the most dangerous form of cardiac disease affecting the pregnant patient. Marshall and Duckworth[117] have demonstrated the preponderance of this lesion over other forms of heart disease in women. Its mortality is placed by many who have studied the subject as exceeding 50 per cent. Jardine[118] considers this death rate as much too high, and reports a number of cases which did well during pregnancy and parturition. Under the writer's observation a young primipara having mitral stenosis passed safely through pregnancy, was delivered by forceps, but had attacks of cardiac syncope during the puerperal state, which yielded readily to stimulation. Fellner is undoubtedly right in drawing attention to the fact that it is not so much the heart lesion itself as its character, and the presence or absence of tuberculosis or nephritis, which determines the mortality.

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[117] Marshall and Duckworth: Thesis, Paris, 1879.

[118] Jardine: Journal of Obstetrics of the British Empire, April, 1902.

Next in gravity come aortic lesions, with a reported mortality of 23 per cent.; and least dangerous is mitral insufficiency, with an accredited mortality of 13 per cent. Complex lesions of the heart are said to cause 50 per cent. of deaths in those who have them. In double mitral lesion, under Hart's observation, seven out of eight cases perished.

Prognosis for the Continuance of Pregnancy and for the Life of the Child.—Fellner estimates that pregnancy is interrupted spontaneously in 20 per cent. of these cases, and that the mortality among the children is at least 25 per cent. Here, again, the presence or absence of complications affecting the kidneys or lungs must be taken into consideration.

In estimating the mortality and morbidity of cardiac disease in pregnancy, Jardine's series of thirteen cases furnishes valuable data. Among his patients were all the different varieties of cardiac lesions seen during this condition. The mortality was one, a case of mitral and tricuspid incompetence, admitted to hospital in labor at full term. Among the complications which were present in these cases were alcoholism, pneumonia, engorged kidneys, and chronic bronchitis.

Treatment.—The treatment of this condition may be considered under the treatment of pregnancy complicated by cardiac disease and labor occurring among these patients.

TREATMENT DURING PREGNANCY.—During pregnancy great importance should be placed upon rest as a medicinal agent. The conditions of the circulation are such that muscular exertion adds very greatly to the labor of the overburdened heart. The stimulating effect of muscular exertion in promoting circulation may be obtained by massage given cautiously, and increased as the condition of the patient warrants. Many of these patients cannot lie down with comfort, and such rest comfortably in a steamer chair or upon a couch with a proper back rest. Rest should be secured not only for the body, but, so far as possible, for the mind, and the patient should be free from the depressing influence of anxiety and emotion as far as possible. As the organs of digestion and assimilation are also overburdened in these cases, such patients must be fed with care. Milk is the ideal food for this condition, because it nourishes the patient, promotes diuresis, and supplies the vessels abundantly with fluid of a bland and dilute character. Patients suffering from cardiac disease complicating pregnancy sometimes improve in a most remarkable manner under rest and milk diet only.

Should compensation begin to fail, cardiac stimulants must be administered. Jardine had the best results with strophanthus, given in full doses for some time. Digitalis may be employed if the conditions are favorable, and occasionally strychnia and atropin may be required. Should pulmonary engorgement threaten, strychnia and atropin will be especially valuable. Alcoholic stimulants are rarely required, but remedies addressed to the treatment of anæmia may be needed.

It is of the utmost importance that elimination be promoted in every possible way. Here no drug compares in value with calomel, given in doses of one-twentieth to one-tenth of a grain three times daily, and continued until the first signs of the physiological effect of the drug are manifest. Its administration may then be omitted until these symptoms have entirely passed away. The bowels must be kept freely open by salines or by mild laxatives, and care must be taken that the intestines are not emptied suddenly nor violently, as fainting may follow such an occurrence. In cases where the circulation is so overburdened that dilatation and failure of the heart are indicated, blood may be taken from the patient with advantage. Where pulmonary tubercle complicates cardiac disease in pregnancy, patients have been much relieved by pulmonary hemorrhage. The patient may be bled should the indication become positive.

TREATMENT DURING LABOR.—Should efforts to maintain the patient in good condition fail, labor must be induced. The occurrence of parturition exposes these patients to new and great dangers, and the mechanism of the condition present must be constantly kept in mind in the conduct of these cases. The uterus cannot be emptied without contraction of the uterus, and yet uterine contractions increase blood pressure and throw an increased quantity of blood upon a weakened and overburdened heart. So soon as the uterus is emptied, the abdominal vessels fill, intrauterine tension is lessened, and the vessels of the lungs are engorged. Secondary syncope may then threaten life through sudden cerebral anæmia and cardiac failure. To carry his patient safely through labor, the obstetrician must empty the uterus with the least uterine contraction possible, and must promptly stimulate the circulatory system of the body so soon as the womb is emptied.

INDUCED LABOR.—When it is necessary to induce labor, the introduction of a bougie and, if necessary, the use of vaginal packing of gauze is the method to be preferred. As the cervix dilates and tension arises upon the membranes, it must be remembered that the greater the tension upon the bag of waters the greater the rise in arterial pressure; hence, should the condition become threatening, the membranes may be ruptured early in labor at the risk of greater danger to the child. It is well to give a full dose of strophanthus or digitalis at the beginning of active labor, and to stand ready to interfere should threatening symptoms arise. So soon as the head has descended sufficiently to make the application of forceps possible and dilatation is largely completed, the patient should be anæsthetized and delivery accomplished by the use of forceps. Many writers bear witness to the especial value of chloroform in these cases. In this country most physicians would prefer to use ether. In dilating the cervix, those methods should be employed which cause least violent uterine contractions. Thus Dührssen's method of incising the cervix is better than the gradual method by the introduction of elastic bags, which set up strong uterine contractions. The value of Bossi's dilator and other metal instruments for rapid dilatation is not yet established in these cases. If version is performed, it should be done under complete anæsthesia, and the child should be extracted very slowly. Cæsarian section is contraindicated, except in those cases where the mother dies suddenly, when the post-mortem operation may be performed to save the child. Should collapse occur during labor, transfusion with salt solution, nitrite of amyl, electricity, digitalis or strophanthus, nitroglycerin, strychnia, and atropin may be used, as the symptoms and the judgment of the operator indicate. So soon as the child is born, the patient may be allowed to lose blood from the uterus to a moderate extent. This will offset a rise in blood pressure, accompanied by the separation of the placenta, and acts as a safety valve upon the damaged and overstrained heart. Under control by anæsthesia, the placenta may be removed, manually if necessary, and the uterus stimulated to contract by a hot intrauterine douche of dilute antiseptic or sterile fluid. After reasonable hemorrhage has occurred, further bleeding should be prevented, and gauze packing will be found efficient in promoting this. After the uterus has contracted, there is no objection to giving strychnia as a stimulant if needed.

During the puerperal period the patient should not nurse her child. If cardiac stimulants are indicated, they should be given, and the patient's nutrition enhanced in every possible manner.

Practitioners should remember that during labor the perilous condition of these patients, their cyanosis, and their threatened collapse not only do not contraindicate the use of anæsthetics, but positively demand them. There is no more striking experience in medicine than to see the relief afforded to a woman suffering with heart disease and in labor from the administration of chloroform or ether. The patient's room should be well ventilated, and whenever possible oxygen should be at hand during anæsthesia. Should the patient be threatened with death from profound engorgement of the circulation during labor, she may be promptly bled and labor terminated as soon as possible. As we have remarked, should the mother perish suddenly before delivery and the child be living, post-mortem by Cæsarian section should be done to save the child.

Should Such Patients Marry?—The advice of physicians is often asked in answer to this question. The gravity of this complication cannot be denied, nor should it be underestimated. Patients must understand that child bearing is attended with greatly increased risk under these conditions. If, however, the cardiac lesion is not one of stenosis, if it is but slight and compensation has been well maintained for a number of years, and if the patient is not rheumatic, gouty, or tuberculous by heredity, she can probably bear a child safely if she will consent to place herself under medical care during her entire pregnancy. But no physician should give an unqualified promise of safe parturition in these cases.

Physicians' advice in these matters may be asked, but is rarely followed. In the face of pregnancy complicated by cardiac disease, the physician should give as much encouragement as the circumstances of the case permit. It is especially unfortunate for these patients to become melancholic or to believe that they are inevitably bound to perish. They must submit to medical care, and be encouraged and comforted in every way possible. The lessened death rate of obstetric operations at the present time gives these patients good reason for hope that pregnancy under such conditions may be brought to a successful termination.

CHAPTER XVI.

DISORDERS OF THE ORGANS OF DIGESTION AND ASSIMILATION COMPLICATING PREGNANCY.

MOUTH AND TEETH.

Few patients pass through pregnancy without some altered condition of the mouth and teeth. The gums are often softer than normal, their edges pale, thin, and shrivelled, and retracted from the roots of the teeth. Along the border of the gum a ridge is often found, deeper in color than the surrounding membrane. This condition is termed "White caries." In other cases the gums are reddish in color, softer than normal, while thin, purulent fluid is found at the neck of the teeth. An altered condition in the secretion of the mouth is supposed to be the cause of this condition, with increase in the formation of saliva and decrease in the amount of ptyalin. The saliva is often acid in reaction in the early portion of the day. In some cases the teeth are greatly altered in color, containing cavities with black margins and a line of brownish discoloration along the upper incisors or canines. The enamel of the teeth is opaque. This is known as "Brown caries," and is usually found in the region of the bicuspids of the upper and lower jaw, and in patients whose hygiene is deficient the dentin of the upper bicuspids and molars is softened. The fact that the bicuspids and molars receive the impact of fluid vomited in the nausea of pregnancy, and that they are in contact with the tongue while at rest, has been advanced as a cause for this condition. Although actual decay may be absent, softening of the teeth, with partial absorption of the alveolus and loosening of the teeth in their sockets, are frequently seen. White or soft caries frequently occurs without apparent cause in patients who give no other sign of malnutrition. Its pathology resembles that of osteomalacia.

Pain in the Face and Teeth.—As a rule, pain in the face and teeth during pregnancy is caused by some abnormal condition in these parts. Occasionally cases are seen in which some pathological condition in other organs causes pain referred to the mouth and teeth. Disturbance of the stomach and chronic irritation of the uterus through ulceration of the cervix have been observed in these cases.

Treatment.—Pregnant patients should consult their dentist several times during pregnancy. Their condition should be made known to the dentist, and he should be cautioned to give as little pain and irritation by his treatment as possible. Fillings should be of a non-irritating character. Temporary fillings should be used in preference to prolonged operations for the insertion of permanent fillings. If a tooth gives rise to severe suffering during pregnancy, it should be removed. Pregnancy has been interrupted as a result of such pain, while the general condition of mother and child suffered from prolonged nervous irritation.

When the gums are very irritable, potassium bromide or potassium chlorate may be used in local application with considerable benefit. For disordered conditions of the gums, powdered boric acid or equal parts of charcoal and precipitated chalk may be applied to the teeth with a soft brush. When the teeth are sound, but obstinate pain is present, counter-irritation by a blister over the fourth and fifth dorsal vertebræ may be tried. In rapid softening of the teeth, alcohol and collodium may be painted over the tooth to prevent the access of air and relieve distress.

DISORDERS OF THE STOMACH.

While functional disturbance of the stomach is very frequent in pregnancy, but few cases have been observed in which actual alterations in the tissues have been found. In most of these conditions the nervous system is more at fault than the stomach, and the gastric distress must be considered more an evidence of a neurotic condition than a pathological lesion.

Functional Disorders of the Stomach.—Excessive secretion of very acid and acrid fluid is not infrequently observed in pregnant patients. This is independent of the ingestion of food, and is usually increased by any irritation or excitement of the nervous system. Such patients complain of hot water rising into the mouth, or "waterbrash," as it is commonly termed. The administration of alkalies often fails to relieve this condition, nor is it influenced by the kind of food which the patient takes, the quantity of food taken, or the intervals of feeding.

For the relief of this distressing condition, the state of the patient's secretions should be interrogated. Many eliminate badly, and all the secretions are altered by a toxæmic condition. The urine should be examined, and the diet altered if necessary. Constipation must be avoided. Most cases are much improved by attention to these simple precautions. To cure this condition, measures adapted to improve the patient's general health are the only efficient means. The patient must be carefully fed and abundantly nourished by suitable diet. The nervous system should be reinforced, undue fatigue avoided, and exercise in the open air taken. Locally, the free use of water charged with carbonic acid gas and a mild alkaline substance is most grateful. These patients will consume large quantities of Apollinaris, Vichy, soda, or other similar waters. Counter-irritation over the stomach is also useful. If the physician remembers that he is treating a neurosis and draws the patient's attention from the condition as much as possible, he will usually be more successful than if he makes much of the gastric complication.

Variations in Appetite.—The so-called cravings of pregnant women have long been considered a frequent accompaniment of this condition. In our observation abnormalities in appetite during pregnancy are neurotic states to be treated accordingly. Probably all healthy pregnant women undergo a natural increase in appetite during gestation. In some cases patients have a better appetite and digestion than at other times. The most frequent form of altered appetite is that in which the patient requires food very frequently and complains of an intense hunger. This is seen in highly nervous patients, many of whom are toxæmic as well. Such cases require simple regulations of the diet, avoiding a toxæmic condition, and allowing the patient to take milk diluted with Vichy, Apollinaris, or soda water, with cracker or biscuit, as often as desired. As pregnancy advances these patients usually improve.

Greatly altered appetite, in which a patient demands strong acids, highly-seasoned food, or enormous quantity of food, must be taken as distinct evidence of a highly neurotic condition, caused by bad assimilation. In these cases the hygiene demands careful supervision, the excretory organs should be freely stimulated, and the patient given an abundance of easily digestible and simple food. It is well to pay as little attention as possible to the cravings of the patient, because their gratification will seldom result to the advantage of mother and child.

Gastric Ulcer.—The anæmia of early pregnancy and the altered condition of the secretions often present favor the development of gastric ulcer. That this is not a more frequent complication of pregnancy is probably due to the fact that anæmia is but temporary with the pregnant woman, and that the blood soon passes into the condition of physiological plethora. The diagnosis and treatment of this condition are essentially that in the non-pregnant, and, fortunately, serious results very rarely follow the presence of this complication.

DISORDERS OF THE LIVER COMPLICATING PREGNANCY.

Atrophy of the Liver.—Under the title "Acute Yellow Atrophy of the Liver," those who have studied the pregnant condition describe a disease characterized by jaundice, hematogenic, and hepatogenic, with a distinct lessening of liver dulness, albuminuria, and tenderness, varying in degree over the liver and abdomen. A period of incubation of three to five days, with gastric and intestinal catarrh, rigors, and pains in the head and back and fever, has been observed. The result of this disease is usually death to either mother or fœtus, and often to both. Fortunately, it is not common, Spaeth finding it but once in more than sixteen thousand pregnant women. That pregnancy predisposes to it is seen in Thierfelder's series of 143 cases, 30 of which were pregnant women. Lomer's extensive paper[119] and that of Matthews Duncan[120] describe this grave disease fully. In the writer's experience a patient was seen with pronounced jaundice and high fever, with septic coma following labor and speedy death. The fœtus was born dead and the amniotic liquid was colored a bright yellow, while the fœtus and its appendages were a deep orange.

There can be no doubt but that an infection from an unknown source is the cause of this fatal disorder. As those bacteria which attack the digestive tract gain access through infected food or water, the prevention of this disease comes under the head of efficient hygiene. In the writer's case the patient lived in a portion of a city where the streets had been extensively disturbed, and where the drinking water was in a particularly foul condition.

Treatment.—Unfortunately, these cases admit of but little treatment. If seen early, bile should be caused to flow into the intestine freely. The patient should be abundantly fed and stimulated, and, should labor begin, the expulsion of the fœtus should be expedited in the manner likely to cause the least shock to the mother. Good hygiene is absolutely necessary for all pregnant patients, and the possibility of such disease should emphasize this necessity.

Jaundice.—Impaction of fæces, catarrh of the bile ducts, pressure of the growing uterus on the liver, and the physiological hyperæmia which all the abdominal organs undergo during pregnancy cause jaundice in greater or less degree. If the kidneys fail in function, added strain is thrown upon the liver, which may result in jaundice. Gall stones may make their presence known during pregnancy, as in the non-pregnant. Severe malarial intoxication during pregnancy may be a grave complication, because the malarial parasite may so markedly change the blood as to produce severe jaundice or bring about a fatal toxæmia.

Treatment.—This condition should be treated in the pregnant patient by those methods successful in the non-pregnant. Strict regulation of diet, the use of mild saline purgatives and laxatives, copious intestinal irrigation with normal salt solution and the administration of such remedies as will prevent a threatened anæmia are all indicated. Should the condition become severe, the contents of the uterus will be expelled, and, as this process is favorable for the mother, no effort should be made to prevent the expulsion of the fœtus.

Urobilinuria.—An abnormal discharge of urobilin may be observed during pregnancy, and Merletti[121] has found this to be a sign of fœtal death. It exists with most pregnant patients, but only becomes of significance when excessive.

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[119] Lomer: Zeitschrift für Geburtshülfe und Gynækologie, Band 13, Heft 1, p. 169.

[120] Matthews Duncan: Lecture on Diseases of Women. 3d edition, p. 295.

Diabetes.—While this disorder may properly be included among diseases of the nervous system complicating pregnancy, the fact that the liver is most at fault in these cases leads us to discuss it under disorders of the digestive organs. Although a grave malady, it is, fortunately, not common, for Frerich in 386 cases saw but 104 among women, and but one of these had diabetes during pregnancy. In some cases the disorder is present only when the patient is pregnant, ceasing with the end of pregnancy and not returning. The existence of diabetes does not prevent conception. The increased metabolism caused by pregnancy makes the occurrence of this disorder a natural one, and Oddi and Vicarelli[122] found that during pregnancy the waste of nitrogenous material caused by fœtal growth and nutrition resulted in greatly increasing the consumption of hydrocarbons. The derangement of this process would naturally result in the occurrence of diabetes.

Symptoms.—Great thirst, the passage of large quantities of urine, a dry, brown tongue, a sweetish odor to the breath, purple blotches on the skin, and a great increase in the amniotic liquid are the symptoms reported. The presence of sugar in the urine draws attention to the condition present. Especially significant is pruritus, either affecting the external genital organs or extending over the whole body.

Mortality.—Maternal mortality from this source is considerable, although statistics bearing directly upon this point are not abundant. For the fœtus the mortality rate is extremely high, and the disorder seems to be attended with a death rate of nearly 100 per cent. for the child.

Course.—Unless the disorder can be controlled, fœtal death occurs, and the mother has an abortion or premature labor. The occurrence of labor does not seem in most cases to be of immediate advantage to the mother, for she frequently grows worse after labor, the disease taking a fatal turn. Upon autopsy, the liver presents the changes usually seen in this disorder, being granular, its tissues in pale, cloudy swelling. The kidneys often resemble the liver in appearance, while the amnion is excessively dropsical, and saccharine matter has been found abundantly in the amniotic liquid. The fœtus shows the characteristic lesions of amniotic dropsy.

Treatment.—Limitation of diet and the use of drugs successful in this disease with non-pregnant patients form the basis of treatment in this condition. Every effort must be made to promote elimination. Care should be taken that the patient has the benefit of a good climate. Failure to reduce the amount of sugar in the urine or pronounced symptoms referred to the nervous system justify the obstetrician in bringing on labor. The development of acetonuria is a symptom of much gravity in these cases, while the occurrence of pronounced impairment of vision draws attention to the possibility of hemorrhage in the retina in this condition.

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[121] Merletti: Annali di Ostetricia, No. 4, 1902.

[122] Oddi and Vicarelli: Lo Sperimentale Fascicolo, Memoire Originali, 1891, No. 2.

Ascites.—Lesions of the abdominal viscera and interference with the circulation of lymph in the peritoneum may cause ascites during the pregnant state. The growth of the uterus sometimes causes ascites, which thereby interferes with the descent of the child into the pelvis. In two Cæsarian sections the writer has seen a considerable quantity of ascitic fluid in the abdomen. Each of these patients had a pelvis so contracted that the child could not be delivered through the vagina. Tubercular peritonitis complicating pregnancy may also cause ascites, developing gradually as gestation advances. Ovarian tumor complicating pregnancy may bring about such distention of the abdomen that well-marked ascites may be present.

Treatment.—Should ascites become a grave condition during pregnancy, abdominal section is indicated. If a tubercular process is present, the patient may greatly improve or even recover. Should some other tumor than the growing uterus occasion the ascites, it may be removed and the pregnancy allowed to continue.

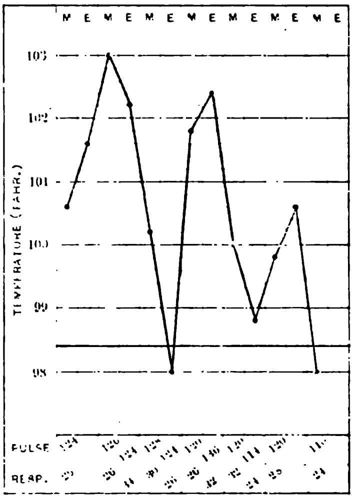
DISORDERS OF THE INTESTINE COMPLICATING PREGNANCY.

Constipation.—The most frequent derangement of the intestine complicating pregnancy is lack in the peristaltic action of the bowel, producing obstinate constipation. This is seen most markedly in neurotic and ill-nourished patients, in whom the muscular and nervous systems are least well developed. Unquestionably, the pregnant uterus, by its bulk, interferes with the discharge of feces and favors retention of fecal matter in the lower and left portion of the abdomen. Constipation in the pregnant condition may be slight and comparative, or so severe and serious as to result in pathological lesions of the intestine. On two occasions the writer has had the opportunity of observing by autopsy the results of obstinate constipation in pregnancy. Each woman had a contracted pelvis, which interfered with the descent of the child, and one patient had perished from pneumonia following a difficult labor, and the other from septic infection. In one case the descending colon was full of hard, black feces, which had thinned the wall of the intestine so greatly by pressure that perforation of the bowel was imminent. In the other case the feces were in a similar condition, but perforation of the bowel had actually occurred. It is true that in these cases prolonged and unusual efforts at delivery had been made, and that these may have had much to do with the intestinal lesions. Had the feces been normal in consistence, and not retained within the bowel, the lesions present would not have been produced. It is not unusual in toxæmia, when the intestine is finally emptied by repeated purgation with calomel and salines, to wash out from the bowel matter which has been appropriately called fecal sand. In some cases this seems actually adherent to the wall of the intestine, so firm is its union with the bowel.

It is not uncommon for these patients to have considerable fever, especially if efforts are made to empty the intestine. The administration of salines usually results in the partial dissolution of retained fecal matter, followed by absorption and the production of fever. This is illustrated in the accompanying chart (Fig. 43) of a case of fecal impaction with intestinal toxæmia. By repeated purgation the intestines were partially unloaded, when the patient declined further treatment.

Treatment.—It is essential in treating these cases to know the contour of the pelvis and the relative size of the fœtus. In cases of contracted pelvis it is especially important that the intestine be kept as empty as possible. The engagement of the head in a slightly contracted pelvis may be considerably interfered with by the constant presence of hardened feces at the brim of the pelvis, while, on the other hand, the fact of pelvic contraction predisposes to constipation. It is the writer's custom in dealing with cases of contracted pelvis to insist upon thorough movements of the bowels during at least the last month of gestation.

FIG. 46.



Chart, fecal impaction with intestinal toxæmia.

In patients especially prone to hemorrhoids, constipation must also be carefully avoided. Many patients date the formation of hemorrhoids to a first pregnancy, during which but little attention was paid to the condition of the intestines.

For promoting a regular and gentle action of the intestines during pregnancy, cascara is safer and usually more agreeable than any other drug. In the form of aromatic elixir, a teaspoonful may be taken night and morning or three times a day until the bowels move freely; then the dose may be lessened until but a half teaspoonful is taken night or morning. Should this preparation be inefficient, the fluid extract or solid extract in capsule or pill form may be used. Should cascara become inert, compound licorice powder is found useful by many patients. The habitual use of salines cannot be commended during pregnancy, for it is apt to ultimately aggravate constipation and favor the occurrence of hemorrhoids. Caution must be used in giving aloes, for this drug tends to increase congestion about the pelvis, and may favor the occurrence of abortion during early pregnancy. The dietetic treatment of constipation is most important, and if carried out with care and thoroughness may often take the place of the use of drugs.

Diarrhœa.—Occasionally in neurotic patients obstinate diarrhœa, accompanied with pain, is observed during pregnancy. The most efficient treatment for this condition is rest and the use of predigested or very simple food. Should these fail, sedative drugs may be used. The mistake must not be made of attempting to check a vicarious diarrhœa in a toxæmic patient. When examination of the urine shows deficient assimilation and persistent diarrhœa is present, the use of calomel and salines, with a selected diet, will cure the condition.

Appendicitis.—This disorder occurs equally in primiparæ and multiparæ at all periods of gestation. In some cases patients suffer from appendicitis of a mild degree during pregnancy, but recover sufficiently to go through labor and to make a partial convalescence during the puerperal state. In other cases appendicitis may develop early in pregnancy, operation reveal abscess, and labor occur, followed by death from exhaustion. Appendicitis in the mother may be followed by umbilical infection in the child. Thus Pinard[123] reports a case in which the mother died at the sixth month of pregnancy from appendicitis, followed by abortion. From the umbilical cord of the fœtus cultures of the colon bacillus were obtained.

Symptoms.—The symptoms of appendicitis complicating pregnancy are those seen in these cases in the non-pregnant condition. Unfortunately, these symptoms are masked by two conditions, which often render diagnosis very difficult. The first is inflammation of the Fallopian tube and surrounding tissue of the right side, which may have been present before pregnancy occurred, and which may persist during pregnancy to the formation of tubal abscess. If the appendix has been adherent near the tube, it may become involved in the condition present. The pain and tenderness of appendicitis may be mistaken for that of abortion. It is usually possible to distinguish contractions of the uterus in abortion, while such are absent in disease of the appendix. A discharge of blood from the uterus may be present in an attack of appendicitis, but should not be persistent nor as great in quantity as in abortion. On the other hand, general peritonitis following a difficult labor may naturally be supposed to have been caused by rupture of the uterus and septic infection. Appendicitis, however, with rupture of a septic appendix, may have been the condition present. Pinard[124] reports a case of this sort. Intestinal occlusion during pregnancy with disease of the appendix may simulate infection of the peritoneum from septic abortion or rupture of the uterus.

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[123] Pinard: Annales de Gynecologie. Vol. 48. 1898.
[124] Pinard: Annales de Gynecologie. May, 1900.

Prognosis.—The prognosis of appendicitis complicating pregnancy for the mother will depend upon early diagnosis and prompt surgical treatment. The presence or absence of pyosalpinx and the occurrence of premature emptying of the uterus influence the prognosis. In cases in which the Fallopian tube is not involved, and in which the patient does not go to operation or to premature labor, prognosis is much better. For the child the prognosis is a bad one, through frequent abortion and premature labor or intrauterine intoxication derived from the mother. The occurrence of abortion or labor is a misfortune in such a case, as the disturbance occasioned by uterine contraction favors the spread of infected material throughout the abdomen.

Treatment.—The obstetrician should view with suspicion all cases of pain and tenderness in the region of the appendix occurring in the pregnant woman. Such call for absolute rest in bed, for the prompt emptying of the intestine, the external application of cold, and a very simple diet. The necessity for operative interference must always be kept in mind, and should the case pass to more than a simple catarrh the appendix should be promptly removed.

In dealing with pregnant women in whom pain and tenderness in the right lower quadrant of the abdomen have persisted for some time, the operator must be prepared at operation to remove an infected tube and ovary and to thoroughly drain this region of the body. The uterus should be disturbed as little as possible, and the field of operation shut off from surrounding tissue as much as possible by packing with sterile gauze. Immediately after operation opium may be used if uterine contractions threaten. Should abortion or premature labor intervene, the uterus should be emptied as quickly and as gently as possible, to avoid the spread of infectious material, through the disturbance occasioned by uterine action, through the abdominal cavity.

THE URINARY ORGANS DURING PREGNANCY.

The Kidneys.—Pathologists have long recognized a congested and hypertrophied condition of the kidneys, which has received the name "the kidney of pregnancy." In some cases the effort to distinguish this from the condition of the kidney seen in beginning nephritis has proven unsuccessful. Only a thorough, systematic, and microscopic examination of the urine can actually determine whether congestion only is present or whether the process has gone to the point of damaging the secreting structures of the kidney, the cells of the tubules. The persistence of granular or fatty casts, the diminution in the quantity of urine, must lead to a conclusion that the kidney is essentially damaged. The diagnosis of nephritis should be based on such evidence, and not upon the presence of a moderate quantity of serum albumen only. Occasionally a condition of beginning fatty degeneration in the kidney is seen, which causes little alteration in the urine, and which may suddenly destroy the patient by rapid kidney failure. (Trantenroth[125].) Evidently an acute inflammation of the kidney cannot be caused by pregnancy itself, nor can actual nephritis be ascribed to pregnancy only. In cases, however, in which a previous infection of the urinary tract has occurred, and in which pregnancy supervenes, there is a distinct possibility that a focus of infection, formerly latent, may be brought into activity by pregnancy, and thus acute nephritis follow. In patients predisposed to degeneration of the kidney epithelia by gouty or rheumatic diathesis or by chronic toxæmia from intestinal sluggishness, the occurrence of pregnancy may prove actually the exciting cause of kidney failure; but the kidney of pregnancy, aside from these conditions, is simply an engorged kidney, in which temporary and functional derangement of the organ readily occurs, and which invites the formation of pathological conditions.

Nephritis and Albuminuria.—It is quite possible for a pregnant patient to suffer from nephritis and albuminuria without the occurrence of eclampsia. In many cases of eclampsia these conditions are present, but in the worst cases of eclampsia there is added to the element of kidney lesions failure in the performance of the functions of the liver, skin, and intestine, which greatly increases the quantity of toxines and enhances the gravity of the patient's condition.

The frequency of nephritis and albuminuria in pregnancy has been subjected to much investigation. In 70 patients Fischer[126] found eight cases of nephritis in which the diagnosis was proven by thorough microscopic examination. If the symptom of albuminuria alone be taken as evidence of nephritis or kidney failure, its frequency has been variously estimated by different observers. Meyer[127] found albuminuria in 5.4 per cent. of pregnant women, casts accompanying the albumen in 2 per cent. As pregnancy advanced, albuminuria was more frequent, so that during the last month 71 per cent. of urine examined contained albumen. Lantos,[128] in the Budapest Clinic, found albumen so constantly present that he considered it as a diagnostic sign of pregnancy only. Utley[129] found 20 cases of albuminuria in 160 pregnant women. Of the 20, 15, or 75 per cent., gave evidence of organic kidney disease. Of the 20 patients, there was no sign of uremia in 12. Saft,[130] in 54.1 per cent. of pregnant women, found albumen present in the urine usually in the second half of pregnancy. Zangemeister[131] estimates that albuminuria has been observed in pregnancy by different observers in frequency varying from 1 to 5 per cent. He believes the average to be from 4 to .7 of 1 per cent. of pregnant women showing albumen in the urine. In the last months of pregnancy Zangemeister found albumen in the urine in 10 per cent. of his cases. If repeated examinations were made during pregnancy during the last three months, albumen was found persistently in 40 per cent. of cases examined, and, of all his patients, 20 per cent. had urine containing casts at some time during pregnancy.

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[125] Trantenroth: Zeitschrift für Geburtshülfe und Gynækologie, Band 30, Heft 1, 1884.

[126] Fischer: Prager medicinische Wochenschrift, No. 17, 1892.

[127] Meyer: Zeitschrift für Geburtshülfe und Gynækologie, Band 16, Heft 2.

[128] Lantos: Archiv für Gynækologie, Band 32, Heft 3.

[129] Utley: American Journal of Obstetrics, September, 1895.

[130] Saft: Archiv für Gynækologie, Band 51, Heft 2.

[131] Zangemeister: Archiv für Gynækologie, Band 66, Heft 2, 1902.

Sufficient evidence, we think has been given to show that albuminuria is a frequent and variable condition occurring during pregnancy, and that it has but little direct bearing upon pathological conditions of gravity. Like many other things in medicine, its value as a symptom is comparative, and can only be appreciated in connection with the presence or absence of *débris* from the kidney, diminution in the quantity of urine passed and marked diminution in the quantity of urea and solids excreted.

Recent study has suggested a comparatively new explanation for the occurrence of albuminuria in the activity of syncytial and other embryonal tissues carried to different parts of the mother's body by emboli and thrombi. Gottschalk and Veit,[132] in a paper read before the Obstetrical Society of Berlin, have called attention to this point. It suggests the possibility of producing immunity from the malignant action of embryonal tissue and the production of albuminuria by the injection of placental tissue.

Prognosis.—Koblanck,[133] in 77 patients who had symptoms of nephritis during pregnancy and labor, found that 59.7 per cent. gave no evidence of a pathological condition of the urine after their recovery from labor; 16.6 per cent. had hyalin casts and leukocytes, with a trace of albumen, after labor. In 15.4 per cent. a simple catarrh of the urinary tract persisted, and in 6.5 per cent. death ensued as the result of nephritis.

Evidently the prognosis of nephritis will depend upon the age and constitution of the patient, and upon the attention which she receives during pregnancy. Young women of good constitution who are carefully watched during pregnancy pass through conditions of apparently great gravity and make satisfactory recovery.

Albuminuric Retinitis.—One of the most serious conditions occurring in a pregnant patient who has signs of inefficient action of the urinary organs is extreme disorder of vision, with either great turgescence of the retinal vessels or retinal inflammation. The symptoms of this condition are dimness of vision, which often goes to such an extent that the patient distinguishes fingers held before the face with great difficulty. On ophthalmological examination the vessels of the retina are seen greatly distended, the retinal color is much less bright and clear than normal, and the whole appearance is that of excessive distention of the retinal vessels, with transudate and beginning choked disc.

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[132] Gottschalk and Veit: Archiv für Gynekologie, Bd. 46, p. 56.

[133] Koblanck: Zeitschritt für Geburtshülfe und Gynakologie. Band 29, 1894.

This symptom must be considered as an indication of grave mischief in the kidneys. Ophthalmologists usually consider it a sign that pregnancy must cease at once. In our experience this does not always mean the induction of labor, but it does mean that the most active and vigorous treatment to increase the patient's elimination should be immediately commenced. We have on several occasions seen young patients, of fairly good constitution, who have become almost blind, make a functional recovery from albuminuria without the induction of labor by appropriate medicinal treatment.

It is exceedingly difficult to ascertain whether these patients make a perfect recovery, as far as the condition of the eyes is concerned. In our experience the functional recovery is fairly satisfactory, but the question of permanent cure could be ascertained by ophthalmological study only.

The Treatment of Nephritis and Albuminuria.—Like many other conditions which affect child-bearing women, the prophylactic treatment of these conditions is most important. So soon as the study of the urine makes a diagnosis possible the patient should be put upon a milk diet, varied only by the use of fruit, bread and butter, and vegetables, and the liver should be made to act by calomel and the bowels should be moved thoroughly by salines. If pulse tension is high, the patient may be given veratrum viride, and hot packs used to stimulate excretion. If the conditions clearly point to necessity for bleeding, this procedure may be adopted. It is safest to put the patient in bed and to cause her to lie between blankets, and in a room having an equable and warm temperature. The inhalation of oxygen is also of value.

To allay the headache in this condition, care should be taken to avoid depressing the patient by powerful sedatives or narcotics. If elimination be freely established, the headaches will cease. To relieve the patient temporarily, trional may be used in small doses or chloral hydrate, watching the depressing effect of the latter carefully; but it must be kept distinctly in mind that the best treatment for the headache and pain in this condition is to be found in vigorous stimulation of the organs of elimination.

The Induction of Labor.—The decision to induce labor must not be made rashly in these cases, and this procedure should not be undertaken until eliminative treatment has been faithfully tried. The period of pregnancy at which complication arises has much to do with the decision to induce labor. Should this complication occur at the sixth or seventh month of gestation, the induction of labor should be avoided if possible, because the prognosis for other treatment is not at all unfavorable. When, however, this condition arises between the eighth and ninth month of gestation, the decision to interrupt pregnancy may be more promptly made.

In determining to induce labor, the following points have been found of practical value: If the number of casts be excessive and they be granular or fatty in character, if the quantity of albumen remains large and the quantity of urea steadily diminishes, the indication for the induction of labor is very clear. If, however, casts are comparatively few and most of them hyaline, the quantity of albumen is not large and it diminishes under treatment; and if the quantity of urea remains above 1 per cent., then the necessity for the induction of labor is not imperative.

The Recurrence of Nephritis and Albuminuria in Succeeding Pregnancies.—The question often arises, Will the patient be exposed to the same or greater risk in each succeeding pregnancy? The answer to this question must be based upon a careful analysis of the general features of each case. If the patient is above thirty, of gouty or rheumatic diathesis, neurotic, and habitually deficient in elimination, each pregnancy will bring increased risk of this complication. If, however, she is of good constitution, and if nephritis and albuminuria in a first pregnancy occurred because of some acute cause and profoundly disturbing element, then a more favorable prognosis may be given. A positive statement in either direction must be carefully avoided, for it is impossible to foretell with accuracy the course of any pregnancy. A most important factor in this question is the circumstances of the patient. If she is so situated that she can have every advantage of medical care, and if she is of a temperament which permits close observation and study of her case, much can be accomplished for her. If, on the other hand, she cannot have adequate medical care, or if she will not comply with directions for dietetic and other treatment, then the prognosis is distinctly bad.

Shall Nephritic Patients Marry?—A distinctly negative answer must be given to this question. Not only must the mother's life be thought of, but the condition of offspring from such parents. There can be no question but that a tendency to deficient elimination is distinctly hereditary, and that the offspring of nephritic patients are below the average in vitality and have increased liability to nephritis. When the danger to the mother and child is considered, it is evident that nephritic patients are not favorable subjects for marriage.

DISEASES OF THE URETHRA AND URETERS COMPLICATING PREGNANCY.

The ureters may be pressed upon by the growing uterus during pregnancy, and become distended by the accumulation of urine. Catarrh of the mucous membrane, with increased secretion, will result, and, should infection be added, an inflammation of considerable gravity may occur. As the presenting part of the child enters the pelvis, pressure upon the ureters is lessened or entirely disappears, and interference with the exit of the urine from the kidneys is removed. In cases of contracted pelvis, in which the child cannot descend normally, the function of the ureters is often disturbed by the unusual prolongation of pressure from the growing uterus.

DISORDERS OF THE BLADDER COMPLICATING PREGNANCY.

During the latter part of pregnancy, as the uterus rises in the abdomen, the bladder is usually drawn up with it until it reaches a point above the pelvic brim. Apparently this is a conservative process to protect the bladder from pressure and injury against the brim of the pelvis. The urethra is correspondingly elongated. In cases where displacement of the gravid uterus occurs, the bladder may be seriously interfered with by the abnormal position of the womb, and retention of urine, with cystitis, may develop. As gestation proceeds, the bladder is drawn upward, and, having little room to enlarge antero-posteriorly, descends laterally as pregnancy goes on.

Cystitis.—Cystitis complicating pregnancy arises from the same causes which bring about the condition in the non-pregnant. Interference with the drainage of the bladder predisposes to cystitis, but the entrance of infective bacteria or communication with some pre-existing focus of infection must be present for inflammation to develop. The colon bacillus is the most frequent cause of cystitis complicating pregnancy. An old gonorrhœal infection of the bladder is very likely to be kindled into fresh vigor during pregnancy.

Cystitis shows itself in the pregnant patient by the same symptoms which give evidence of its occurrence in the non-pregnant. The urine is altered in character, containing bacteria, being alkaline in reaction if long retained within the bladder. Irritability of the bladder, with tenesmus, may be present, and the patient may be greatly annoyed by a desire to empty the bladder very frequently. As pregnancy draws to a close and the presenting part descends in the pelvis, pressure upon the urethra may add to the patient's discomfort. Infection may travel from the bladder up the ureters to the kidney and pyelitis, and abscess of the kidney may develop.

Treatment.—Infection of the bladder occurring during pregnancy is to be treated essentially as in the non-pregnant. Under strict antiseptic precautions, the bladder should be emptied by siphonage, and the mucous membrane thoroughly irrigated with mild antiseptic solutions. Rest in bed, the avoidance of cold and dampness, and milk diet, saline purgation, and counter-irritation over the bladder are all valuable.

Special attention must be paid to strict antisepsis in washing out the bladder. This procedure should be carried out with the greatest gentleness, and every precaution be taken to avoid injury to the mucous membrane of the neck of the bladder. It is important that the condition should be efficiently dealt with before labor, because the tendency to septic infection after labor is much increased by a pre-existing cystitis.

Compression of the Urethra and Irritability of the Bladder. When the proportion between mother and child is normal, the urethra escapes compression during pregnancy and labor. When, however, the pelvis is contracted or the child is abnormally large, the urethra may be partially occluded by the presenting part and spontaneous emptying of the bladder may become impossible. The writer performed Cæsarian section upon a patient brought to the Jefferson Maternity for some disease of the bladder. The patient was in labor, a fact which had not been recognized, and had a highly-contracted pelvis. The head had been forced partially into the pelvic brim and had almost occluded the urethra, the bladder becoming greatly distended and spread out upon the anterior surface of the uterus. In opening the abdomen, especial precaution had been taken to avoid wounding the bladder. The urine was not completely removed from the bladder by catheter until after the section had been performed. It is obvious that in cases of disproportion between mother and child during the latter months of pregnancy the bladder should be efficiently and frequently emptied. If this is impossible spontaneously, the catheter should be used.

Irritability of the bladder is a not infrequent and annoying complication of pregnancy. It often occurs in highly neurotic and gouty women, in whom any irritation creates abnormally great distress. It is aggravated by a diet of rich and indigestible food, by exposure to cold and damp, by the continued wearing of the corset during pregnancy, by obstinate constipation, and by the use of alcoholic beverages.

Treatment.—Compression of the abdomen should be removed and clothing be properly adjusted. It is especially important that the patient's diet be corrected, and that milk be substituted for meat and richer foods as much as possible. Constipation must be prevented by the use of mild and simple laxatives. The patient must be instructed to empty the bladder regularly whenever possible. Water containing a small percentage of alkali may be used to advantage. At night suppositories containing ichthyol may be inserted at bedtime to reduce the disturbance of sleep to a minimum. The general condition of the patient should be improved by good hygiene and by tonics, and in highly neurotic women every effort should be made to encourage the patient and to divert her mind from her ailments.

Cystocele.—In patients in whom the muscular tissues are very thin and elastic, as pregnancy draws near its close, the pressure of the presenting part may force the bladder down upon the vaginal wall, and this yielding may permit the formation of cystocele. In these cases a tumor is found on the anterior vaginal wall, which disappears when the patient is in the recumbent posture and the bladder is emptied by catheter. Orr[134] describes a very unusual form of cystocele, in which a mass resembling a thick umbilical cord or loop of the bowel was felt within the vagina. On examination two protrusions were found, which were patches of the bladder, separated by relative constriction. The condition was practically an hour-glass form of the bladder. The patient recovered completely after labor, which was spontaneous and occurred without injury to the mother.

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[134] Orr: Scottish Medical and Surgical Journal, May, 1901.

THE TOXÆMIA OF PREGNANCY.

By this term is understood a condition of autointoxication, with poisons alkaloidal in nature secreted within the patient's body, and probably by the fœtus also.

It is probably true that very few patients pass through pregnancy without more or less of this condition. When we remember how few persons there are whose digestion and assimilation are perfect, and that, in addition to any pre-existing fault, the pregnant woman is burdened by the metabolism of the fœtus, we cannot be surprised that toxæmia in pregnancy is so frequent.

The Kidneys.—Many efforts have been made to isolate the poisons which cause this condition. Attention was first directed to the urine, and investigators sought to isolate from this the toxines present. Dührssen[135] has laid much stress upon the retention of creatin and creatinin by the kidneys of the pregnant patient. Its absorption from the urinary tract is furthered by the congested and partially occluded condition of the kidneys and ureters. Creatin and creatinin are capable of producing irritation of the brain by circulating in the vessels of the cerebral cortex.

The Intestines.—The principal site of the formation of these poisons is unquestionably the intestinal tract. Budin[136] and many others have called attention to this condition. There is abundant evidence that prolonged constipation greatly increases toxæmia, and that Nature endeavors to partially protect the patient by causing the drying of retained feces, thus rendering their absorption more tardy. When salines are given to pregnant and constipated patients, retained fecal matter is dissolved, fresh absorption occurs, followed by a temporary rise of temperature, and often by sweating. This speedily subsides when the intestinal tract is completely emptied.

The Liver.—Almost of equal importance with the intestine is the liver as an agent in the production of toxæmia. Prolonged derangement of the functions of the liver is invariably followed by the development of this condition. Fothergill and Stenhouse[137] report a typical case of hepatic toxæmia in which the liver was tender, its dulness increased, bile was absent from the stools, but was freely present in the urine. It became necessary to induce labor, after which the patient recovered. In patients perishing from toxæmia and eclampsia, autopsy discloses parenchymatous hemorrhage in the liver, with areas of softening and disintegration, and with extensive blood stain of the tissue. In ordinary cases it is difficult or impossible to map out diminished liver dulness or increase in the size of the liver, although no doubt can exist regarding the inefficient performance of the functions of the liver during pregnancy.

The Skin.—In toxæmia the skin of the patient acts in a very deficient manner. Eruptions produced by the retention of irritating matter in the skin are not infrequently seen; in some patients the skin is exceedingly dry and harsh, and in acute attacks of toxæmia following the absorption of a considerable mass of toxines from the intestine the skin may act with excessive freedom, and a relaxed and clammy condition of the integument may be present.

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[135] Dührssen: Archiv für Gynækologie, Band 43, Heft 3.
[136] Budin: La Semaine Medicale, Vol. 19, 1893.
[137] Fothergill and Stenhouse: British Medical Journal, March 3, 1900.

The Lungs.—It is difficult to obtain in ordinary cases direct evidence of failure in the action of the lungs in these cases. We observe that those patients who are least in the fresh air are most apt to develop this condition. Women who work in ill-ventilated shops or houses, and who, in addition, suffer from obstinate constipation, are exceedingly favorable subjects for toxæmia and eclampsia. Another fact which emphasizes the necessity for abundant oxygen is the frequent desire of pregnant women for fresh air, and the fact that during pregnancy many women cannot remain with comfort in rooms in which the air is not frequently changed. In patients dying of eclampsia, autopsy confirms our belief in the importance of the action of the lungs in pregnancy. If toxæmic patients survive eclampsia, they are very liable to perish from gangrenous pneumonia, autopsy disclosing areas of hemorrhage and disintegration of pulmonary tissue, with extensive congestion at the bases of the lungs. The lesions are not those of pneumococcus infection, but are those of gangrene, induced by changes in the capillaries of the lungs and extensive disintegration of the blood.

The Blood.—The condition of the blood in toxæmia varies with the severity of the poisoning present. In proportion as toxines overwhelm the capacity of the blood for oxygenation, its corpuscles are disintegrated and its serum is stained with hæmatin in solution. Levinowitsch[138] found in the blood of toxæmic patients who had eclampsia large cocci, of oval form, moving freely. These germs gave cultures on suitable media, and by injection into animals produced acute anæmia, with hemorrhagic endometritis. The serum of the blood in toxæmia becomes distinctly poisonous, and by injection into animals is capable of producing convulsions, coma, and death, with the characteristic lesions of toxæmia in the various organs of the body. Accompanying the changes in the blood is the altered pulse tension, long recognized as a valuable symptom. The toxæmic blood produces a constant irirtation of vaso-motor nerves, resulting in increasing arterial tension to a marked degree. Tridondani[139] has shown this very plainly by sphygmographic tracings, having a strong systolic impulse and rapid fall of pressure, with a marked rebound.

The Infectious Theory of Toxæmia.—Stroganoff[140] and others have advanced arguments to prove that toxæmia is of an infectious nature. Stroganoff believes that one attack confers some degree of immunity against another, and that the severity of the disease differs in various periods and that its frequency depends upon overcrowding of the population. He thinks he has found distinct evidence of its transmission from mother to child. The period of incubation he believes to be from ten to twenty hours.

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[138] Levinowitsch: Centralblatt für Gynäkologie, No. 46, 1899.
[139] Tridondani: Annali di Ostetricia, No. 1, 1901.
[140] Stroganoff: Zeitschrift für Klin. med. Band 39, Heft 5 and 6.

The Mechanical Theory of Toxæmia.—It has long been supposed that interference with the passage of urine through the ureters by pressure from the uterus occasioned retention of urine and absorption of toxines. While the growth of the womb may interfere at times with the passage of urine, this element is not sufficiently important to explain the frequency of the occurrence of toxæmia and eclampsia.

The Study of the Urine in Toxæmia.—For a long time the attention of the obstetrician was directed exclusively to a study of the urine in patients threatened with eclampsia. In recent years Stewart,[141] Dührssen,[142] Laulame and Chambrelent,[143] Ludwig and Savor,[144] Volhard,[145] Schmorl,[146] Massen,[147] Krönig,[148] and others have experimented with the urine of toxæmic and eclamptic patients to ascertain if possible the poisonous element which it contained. It was found that in the urine of pregnant and non-pregnant women poisons of unknown nature are constantly present. If the metabolism of the body is properly performed, the urine is rich in poisons, and this urine, when injected into animals, causes convulsions and death. The blood serum of patients from whom this urine comes was found not poisonous. One of the first signs of a toxæmic condition was diminution in the percentage of urea present and the accumulation of poisons in the secreting glands of the body. The blood serum, from being innocuous, became highly poisonous. If the urine was greatly lessened in quantity, it became more than usually toxic; but if the quantity remained fairly large, its ratio of toxicity was often diminished or not increased. It is evident from this and allied studies that the more highly poisonous the urine the more successful the excretion of the patient and the less danger of toxæmia and eclampsia.

The Quantity of Urea as a Clinical Index.—The writer[149] and others have called attention to the importance of the quantity of urea excreted as an index of the perfection of the patient's excretory processes. Although urea itself is not a poison, it represents the finished product of metabolism in a considerable degree. If urea is formed, poisonous substances are not, and hence a high percentage of urea indicates good general metabolism and excretion. If urea drops and the quantity diminishes persistently, then excretion is at fault and danger threatens.

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[141] **Stewart:** American Journal of Obstetrics, 1897-1898.

[142] **Dührssen:** Archiv für Gynäkologie, Band 40, p. 328.

[143] **Laulame and Chambrelent:** Annales de Gynecologie, 1890, p. 253.

[144] **Ludwig and Savor:** Monatsschrift für Geburtshülfe und Gynäkologie Band 1, p. 466.

[145] **Volhard:** Monatsschrift für Geburtshülfe und Gynäkologie, Band 5, p. 411.

[146] **Schmorl:** Archiv für Gynäkologie, Band 40, p. 329.

[147] **Massen:** Centralblatt für Gynäkologie, 1895, p. 1,107.

[148] **Krönig:** Centralblatt für Gynäkologie, 1894, p. 375.

[149] **Davis:** American Journal of Obstetrics, December, 1893, and American Journal of the Medical Sciences, February, 1894, p. 147.

Serum albumen and casts draw attention to the condition of the kidneys only, but the percentage of urea gives valuable information regarding the general metabolism of the pregnant patient.

The Significance of Peptone.—Several observers have thoroughly studied the occurrence of peptone in the urine to determine the question of its significance as indicating toxic processes. In excess, peptones call attention to possible fœtal death, and may naturally occasion suspicion of toxæmia, but in any but excessive quantities they are entirely negative in their significance.

The Cause of Toxæmia.—To no one substance can be ascribed the exclusive function of causing toxæmia. The waste of nitrogenous tissue, compounds of potassium, animal alkaloids produced in the body of the patient, ptomaines introduced from without, and bacteria and their products, are undoubtedly active as causal agents. To this must be added substances produced by the abnormal action of the syncytial cells, whose normal function is to maintain the body of the pregnant woman in a condition of immunity from toxines.

Toxæmia in the Fœtus.—Griffith and Eden[150] describe and illustrate the case of a patient who had eclampsia and recovered after the induction of labor. She soon afterward became pregnant, and, severe toxæmia appearing, the uterus was emptied as early as the fifth week. Microscopic examination of the ovum showed myxomatous and fatty degeneration of the decidua and chorion. Vacuolation of the cells of the chorion was present, with deposit of fat in the villi.

As pregnancy advances the fœtus has the same lesions in toxæmia which endanger the life of the mother. Punctate hemorrhage in the liver, degeneration of the epithelia of the kidneys, capillary hemorrhage of the mucous membranes, and arterio-sclerosis in the cerebral vessels are present in these cases. It is not infrequent for a child born of an eclamptic mother to perish of toxæmia shortly after birth. In many cases conservative processes of Nature are illustrated by the death of the fœtus and immediate improvement of the mother. The danger of fœtal death in these cases affords another reason for their vigorous treatment, and may in some cases justify the interruption of pregnancy.

Treatment.— The general prophylaxis of toxæmia is embraced in the proper hygiene of pregnancy. Very few patients pass through pregnancy without necessity for regulation of diet, attention to dress, to the action of the intestines and liver, and to fresh air and the taking of exercise. Abundant experience proves the value of limiting the use of meat in pregnant patients and encouraging the free and abundant use of milk. Another factor of importance, especially with highly nervous women, is the procuring during pregnancy of sufficient rest. With a simple diet, with sufficient rest, and with the other elements necessary for general good health, toxæmia can be avoided in women of sound constitution.

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[150] Griffith and Eden: Transactions Obstetrical Society of London, 1899, Vol. 41, Part 2.

In women who inherit gout, lithæmia, rheumatism, and cardiac or nephritic disease, closer attention during pregnancy is necessary. Such patients must be protected from unfavorable climate and from exposure to cold and wet. We think tea and coffee should be avoided; saline waters, such as Vichy, should be used during pregnancy, and a strict supervision kept of the patient. In cases having a history of previous eclampsia or toxæmia, frequent examinations of the urine are required. The diet of such patients must be studied with great care and thoroughness, and every effort made to keep the patient's digestion and assimilation in a balanced condition.

The treatment of pronounced and threatening toxæmia demands vigorous stimulation of the processes of elimination. Such a patient should be put in bed between blankets. The diet should be immediately reduced to milk, with an abundance of dilute saline water, and for forty-eight hours at least the patient should be kept as strictly as possible to a milk diet. Calomel may be administered in one of two ways, either in one considerable dose of 2½ to 5 grs., with bicarbonate of soda, or in doses of ½ gr. every hour until the desired action is secured. The choice of administering this drug will depend upon the urgency of the symptoms and the patient's susceptibility to medication. The patient should be urged to drink freely of water, and Vichy water will be found especially advantageous in these cases. When sufficient time has elapsed for a free secretion of bile, salines may be administered. Here sulphate of magnesium is especially useful, and may be given in small and repeated doses until very free evacuation of the intestine is secured. The use of saline by the mouth may be supplemented by the use of saline fluid by rectal injection. The good effect of calomel in these cases is seen not by purgation, but by increased action of the kidneys and increase in the percentage of urea and solids excreted. Physicians are sometimes disappointed in the use of calomel in these cases because copious purgation does not follow. If the results desired are understood, there need be no disappointment upon this ground, and recourse may be had to prompt and efficient methods of emptying the bowel.

To use saline injections, a soft rubber rectal tube of medium calibre is necessary. This should be attached to a large fountain syringe. At least one gallon of warm normal salt solution should be prepared, at a temperature of 110° F. The patient should be turned upon the left side, her hips brought to the edge of the bed, and her bedding protected by rubber sheeting or a suitable rubber pad. The hips should be raised considerably above the rest of the body. The tube, well lubricated, should be introduced and, with a gentle spiral motion, should be carried as high into the bowel as possible. Some time is necessary for this manipulation, and fluid may be allowed to run for part of the time during the introduction of the tube. The effort should be not to secure an immediate withdrawal of feces, but to introduce as much fluid as possible and as high into the bowel as possible. As the bowel becomes distended, fluid will make its way back along the tube, and with it fecal matter. The injection should be continued, and a second gallon of fluid may be used until from one to two quarts have been retained within the body and considerable discharge of fecal matter has occurred. A copious movement of the bowels may not follow for some time after this injection, but the effect in promoting elimination is prompt and satisfactory. This manipulation may be repeated in two hours, until copious fecal discharges have occurred and the patient has absorbed from two to four quarts of saline solution.

Of great value in these cases is the use of the hot pack. Its administration requires the services of one or more trained nurses, and the patient should be, if possible, under the observation of the physician while the pack is given. The great stimulation which the pack gives to the vaso-motor nervous system may result in the explosion of nervous energy in the brain and in the production of eclamptic convulsions; hence, there should be in readiness some means of controlling increased arterial tension during the giving of the pack. We have found most advantageous the use of veratrum viride by hypodermatic injection, giving a moderate dose so soon as pulse tension commences to rise. Sweating is hastened by these means, and eclamptic convulsions are averted.

The above is well illustrated by a case of toxaemia with threatened eclampsia, complicated also by engorgement of the retina with threatened retinitis. This patient had a blood pressure of 185 mm. of mercury, while the normal blood pressure in pregnancy does not average above 130. Severe headache and a hard, firm pulse, in spite of restricted diet, threatened eclampsia. Fifteen minutes before the patient was placed in a hot pack blood pressure was 185 mm. Five minutes after the pack began it had risen to 190. Thirty minutes after the pack began it had fallen to 180. One-half hour after removal from the pack it was 170, and on the following morning it was 165. On the next day, the blood pressure being the same, the pack was repeated, and blood pressure fell to 150 mm. On the following day the pack was repeated for a blood pressure of 160 mm., which fell to 155 mm. During the administration of this pack veratrum viride was in readiness for hypodermatic use, but, as the patient's pulse tension yielded gradually to the pack, it was not administered. This patient expelled a stillborn fœtus, making herself an uninterrupted recovery. The placenta showed advanced degenerative changes, with obliteration of the vessels by infarction.

Few cases of toxaemia resist this treatment faithfully carried out. Within twenty-four hours the quantity of urine increases, the percentage of urea and solids is greater, threatening symptoms subside, the patient feels relieved ,and is usually anxious for more food. She should still be kept in bed and between blankets; the diet should not be materially increased, but milk toast or dipped toast, baked and stewed apples, stewed dried peaches, the pulp of prunes, junket, buttermilk, and a moderate quantity of cream may be added to the diet. After an intermission of twenty-four hours, calomel may be administered a second time in less dose and the use of dilute salines continued freely. A return of headache, increased pulse tension, and dry skin call for repetition of the hot pack and saline injection.

It is evident that this treatment cannot be entrusted to a patient or to her friends. This treatment requires the services of experienced obstetric nurses, who have had especial training in obstetrics. The physician should be present when the hot pack is given, ready to administer veratrum viride or nitrite of amyl if necessary. Physicians should not make the mistake of attempting this treatment without suitable assistants. When such cannot be obtained and the physician must trust to drugs alone and to a reasonable co-operation on the part of the patient, then the most vigorous purgation is the safest method of treatment. Three compound cathartic pills, freshly made and with no insoluble coating, should be administered. A better result is sometimes obtained by a capsule containing two grains of calomel and one or two drops of croton oil. The patient should be urged to remain in a warm room and drink freely of hot water containing salines. Two ounces of Rochelle salts may be prescribed, a tablespoonful in a glass of hot water every half hour or hour until all is taken. The diet should be strictly limited to milk, and by this means many cases not severe in character may be treated. Where, however, eclampsia threatens, this treatment is not sufficient, and the personal supervision of the physician and the administration of veratrum viride are required.

After-Treatment.—If a patient passes through an attack of toxæmia, successfully avoiding eclampsia and making a fair recovery, she should remain under careful observation during the remainder of her pregnancy. The tendency in these cases is for toxæmia to recur. Anæmia is often the result of toxæmia, and requires the attention of the physician if mother and child are to be in sound condition. Severe toxæmia should always lead to careful investigation to ascertain whether the child has survived the toxæmia. The severest cases result in fœtal death and in the gradual production of labor. Many patients recovering from toxæmia suffer from neuralgia during the remaining portion of pregnancy. This arises from the anæmia caused by the long interference with assimilation, and calls for the administration of iron and arsenic and the observance of a strict and correct hygiene.

CHAPTER XVII.

DISORDERS OF THE NERVOUS SYSTEM.

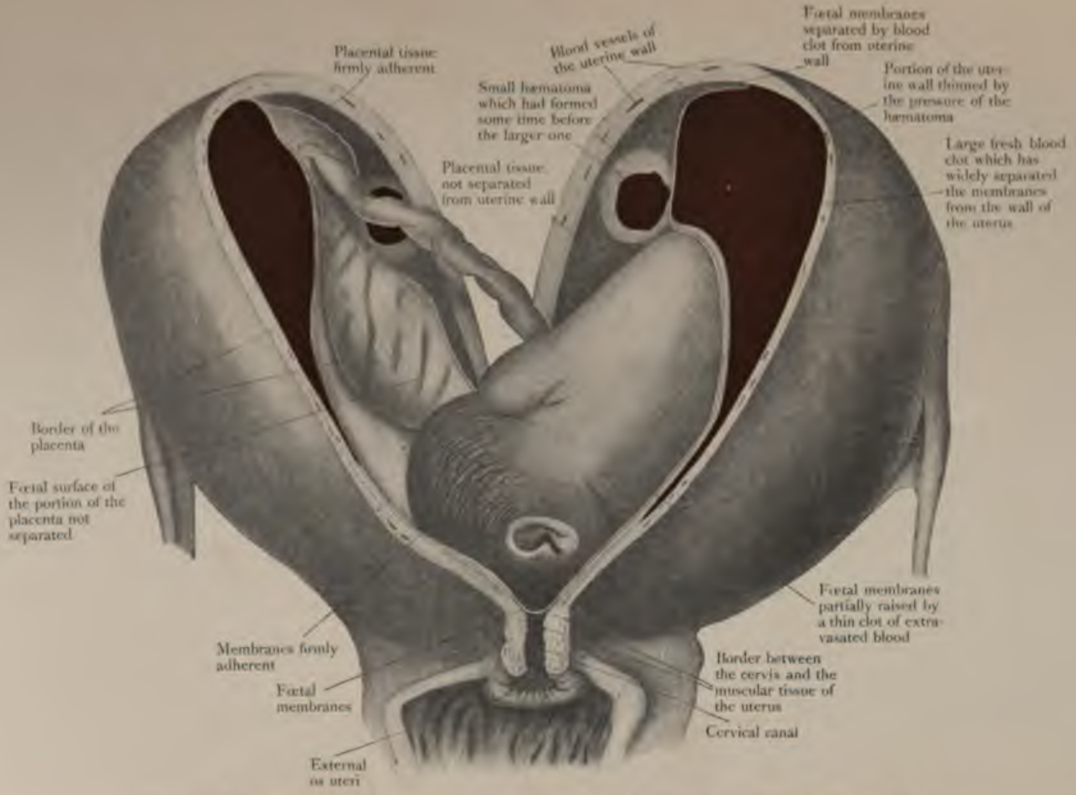
Eclampsia.—The most important and dangerous disorder of the nervous system during pregnancy is undoubtedly eclampsia. It is the culmination of toxæmia, and consists in epileptiform convulsions, involving the entire muscular system, produced by the circulation of toxine-bearing blood through the motor centres of the brain and cord. Although the term "eclampsia" has been applied to other forms of convulsions, usage has limited the present use of the word to the convulsions of pregnant women.

From the earliest history of medicine many efforts have been made to explain this phenomenon. Cerebral anæmia, cerebral hyperæmia, constriction of the vessels supplying the brain, uremia, the action of bacteria upon the blood, climatic influences, and intoxication with the products of fœtal metabolism have all been advanced as causes. No one of these has proven sufficient, and in the present state of our knowledge the most rational explanation of eclampsia is the irritation of the motor nervous centres by blood laden with toxines.

The Clinical Evidence in Support of this View.—While a complete demonstration of the truth of this view may be lacking, clinical evidence is distinctly in its favor. Eclampsia occurs most frequently in toxæmic patients; it happens most often at those periods of the year when the temperature and atmospheric conditions are least favorable for perfect elimination; it occurs more frequently in primiparæ than in multiparæ; it can follow a sudden exposure to cold and wet, and it is cured by those measures which immediately remove accumulated waste in the mother's body. Those procedures which lessen the irritability of the nervous system or prevent irritation in the nervous system diminish the frequency of eclampsia. Uremic patients frequently escape eclampsia, which shows that something more than uremia must be present to bring about the condition.

The Symptoms which Threaten Eclampsia.—The prodromal symptoms of eclampsia are those of exaggerated toxæmia. The patient has severe headache, usually located distinctly in the temples or forehead, flashes of fire before the eyes or progressive loss of vision, abnormal dulness of intellect, increased reflex activity of the nervous system, increased pulse tension, with a heavy and strong cardiac impulse. In the writer's experience, a patient has suddenly broken out in acute mania, attacking her sister without cause. Another patient was admitted to a hospital, passed through eclampsia and labor, and did not become conscious until some time after delivery. She remembered nothing which happened in the hospital. It is impossible to believe that eclampsia occurs without symptoms, and cases in which this is alleged to have happened must be referred to the fact

PLATE XIV.


Placental tissue firmly adherent
Blood vessels of the uterine wall
Small hæmatoma which had formed some time before the larger one
Placental tissue not separated from uterine wall
Fœtal membranes separated by blood clot from uterine wall
Portion of the uterine wall thinned by the pressure of the hæmatoma
Large fresh blood clot which has widely separated the membranes from the wall of the uterus
Border of the placenta
Fœtal surface of the portion of the placenta not separated
Fœtal membranes partially raised by a thin clot of extravasated blood
Membranes firmly adherent
Fœtal membranes
Border between the cervix and the muscular tissue of the uterus
Cervical canal
External os uteri

Fatal eclampsia with premature separation of a normally situated placenta.
(Sietz: Archiv für Gynækologie, Band 69, Heft 1, 1903.)

that so many pregnant patients receive but little, if any, medical supervision during pregnancy.

Diagnosis.—Eclampsia resembles hystero-epilepsy most closely. An accurate diagnosis cannot be made, so far as the convulsions alone are concerned, between epilepsy and eclampsia. The writer saw in consultation a case which perfectly simulated eclampsia, in which the patient had no convulsions when left alone, and in which close observation demonstrated the fact that hysteria and hystero-epilepsy were present. Conversely, dementia and convulsions may be mistaken for eclampsia, as in a case sent to the Jefferson Maternity by her attending physician, who diagnosticated eclampsia in a neurotic degenerate, in whom the suffering of labor excited hystero-epileptic convulsions. A differential diagnosis must be made in these cases between eclampsia and epilepsy, hystero-epilepsy, insanity, strychnia poisoning or other conditions producing general convulsions. The diagnosis of toxæmia and our knowledge that it is the cause of eclampsia makes a differential diagnosis possible. The examination of the urine, evidence of the abnormal condition of the digestive tract, the state of the skin, of the mucous membranes, and of the pulse will assist in confirming a diagnosis.

When is Eclampsia Most Liable to Occur?—So far as the classification of patients may be made, eclampsia is seen most frequently in primiparæ above the average age of child-bearing or of a gouty, rheumatic, lithæmic, neurotic, or constipated habit. Women of luxurious habits, taking little exercise and eating much rich food, are excellent subjects for eclampsia. Hard-worked, anæmic, tea-poisoned multiparæ are also good subjects for this condition. Those who use tea and coffee to excess and work at sedentary pursuits are very liable to eclampsia.

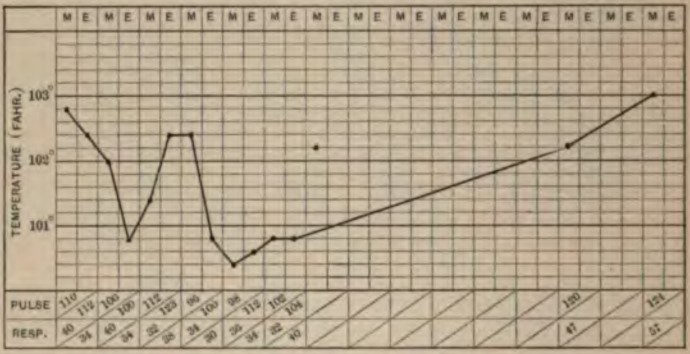
In most patients under ordinary conditions there occurs about four or six weeks before labor a temporary diminution in the solid waste produced by the body. The quantity of urea formed is lowest at this time, and in some patients the urine shows that the kidneys are overburdened. With attention to hygiene, this period is usually passed successfully, and as the child descends in primiparous patients into the pelvis a distinct improvement in elimination occurs. In patients without care, eclampsia is most apt to take place a month or six weeks before labor. In patients under fairly good hygienic conditions, or in whom some attention is paid to elimination, eclampsia is more apt to occur later in pregnancy than at this especial time. The fœtus grows most rapidly from the sixth to the seventh or eighth month, and this fact may partially account for the frequent occurrence of eclampsia at this period of gestation.

Unquestionably, an active and exciting cause may be speedily followed by eclampsia. An abundant meal of indigestible food, fright or shock, exposure to wet or cold, and the induction of labor, all may be followed immediately by eclampsia. The irritation produced by the presence of a bougie in the uterus and beginning labor pains causes eclampsia very frequently.

The Convulsions.—When eclampsia occurs, the patient becomes suddenly unconscious, the face and eyes are turned toward the right, clonic and tonic spasms of the voluntary muscles follow, the jaws are brought firmly together, the tongue may be caught between the teeth and bitten; the fixation of the diaphragm and ribs produces asphyxia, with carbon dioxide poisoning and a bluish color of the face. Tonic spasm of the voluntary muscles follows, with severe clonic spasms of the great muscles of the limbs and trunk. The patient's motions may be so violent as to throw her from her bed. Forced expiration finally occurs, and mucus is blown into the mouth and nostrils, and may be tinged with blood from wounds upon the tongue. The patient's color gradually grows paler, stertorous breathing replaces spasm of the respiratory muscles, and the patient sinks into an unconscious or partially delirous sleep, from which she is roused by a fresh convulsion.

History.—Eclampsia usually sets up labor, and labor may be violent, the uterus acting spasmodically and expelling the fœtus with great force. During the time when the fœtus is passing through the birth-canal, convulsions are most severe. The patient's temperature gradually rises, and the pulse gradually increases as the nervous centres become exhausted. The patient remains unconscious in the intervals between the convulsions, her breathing becomes more labored, and pulmonary congestion and edema supervene. In fatal cases the continued embarrassment of respiration and violent muscular action cause an acute and profound toxæmia, the heat centre becomes paralyzed, the temperature rises to 104° F. or 105° F., the action of the heart fails, the respiratory centre is overcome, and death ensues. In favorable cases the eliminative organs act freely, the patient becomes conscious, or partially so, convulsions occur at long intervals and finally cease, the patient is able to swallow, and gradually returns to a nearly normal condition. Recovery may ensue without the expulsion of the fœtus, although in cases in which eclampsia occurs during the latter part of pregnancy the expulsion of the fœtus seems to favor the recovery of the mother.

FIG. 47.

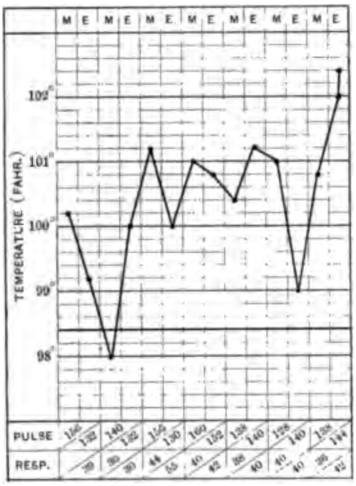


Chart, rapidly fatal eclampsia, stillborn child.

Convulsions do not cease in many cases when the child is delivered; in fact, the patient may have eclampsia first after the birth of her child, as in a case occurring under the observation of the writer, in which a patient who had been delivered in the afternoon was taken with eclampsia during the night following, and fell out of bed in the violence of her first convulsion.

Pathological Anatomy.—If an eclamptic patient survives her convulsions and is delivered of the fœtus, she is not yet removed from danger. Gangrenous pneumonia, nephritis, extensive degeneration of the liver substance, cerebral hemorrhage, cerebral edema, sudden dilatation of the cardiac ventricles, and exhaustion all threaten her recovery to health. Autopsies give abundant evidence of the multiform character of the lesions present and of the fact that all of the organs of elimination are affected. Glockner[151] found lesions of the liver in 76.9 per cent. of cases examined by autopsy, pneumonia in 57.7 per cent., edema of the lungs, edema of the brain, and other lesions. Lesions of the kidney may or may not be present, and are those characteristic of nephritis in various stages when they are found.

FIG. 48.



Chart, fatal toxæmia and eclampsia with hepatic hemorrhages.

In the writer's observation, the most constant lesions of eclampsia are those of the liver and lungs, disease of the kidneys being secondary in frequency as well as in the severity of the lesions present. Schmorl[152] reports an interesting case of eclampsia in which, in addition to the characteristic lesions of the liver, lungs, kidneys, and heart, extensive hemorrhage in the region of the pons Varolii and medulla oblongata was found. The patient had a small fibroid upon the peritoneal surface of the uterus, and upon the ovaries and peritoneum there was a decided growth of decidual cells. An examination of the blood was made as soon as possible after death, and it was found that syncytiolysis did not occur. Bell[153] reports the case of a patient dying from eclampsia in whom infarcts of the liver, with extensive fatty degeneration, were found, the organ being in an early stage of acute yellow atrophy. The kidneys were but very slightly diseased. An examination of the toxicity of the blood was made by injecting blood serum into guinea pigs, the death of the animals following within twenty-four hours after injection. For purposes of comparison, blood withdrawn from two cases of nephritis and uremia was examined by the same method. In neither case did the blood from the nephritic patient produce serious symptoms in the animal. Nothing followed its injection but a very slight diminution in the animal's general vigor for a few hours.

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[151] Glockner: Archiv für Gynäkologie, 1901, Band 63, Heft 1 and 2.
[152] Schmorl: Centralblatt für Gynäkologie, No. 40, 1902.

The microscopic examination of organs diseased in eclampsia shows extensive degeneration of secreting cells, giving way of capillaries, with extravasation of altered blood and blood staining in the tissues.

Mortality.—The mortality of eclampsia is variously estimated. Stroganoff[154] has attracted much attention by his publication of a series of 58 cases of eclampsia without maternal mortality. His experience is unique. Bayer[155] examined the statistics of 63,281 cases of labor at Cologne, finding 39 cases of eclampsia recorded. In his experience the maternal mortality reached 24 per cent., two of his cases becoming insane and dying in asylums. The mortality of the children in this series was between 45 and 50 per cent. Knapps[156] collected a series of cases, not extensive, showing a mortality of 4.5 per cent. Then came more unfavorable cases, bringing the mortality up to 14.6 per cent. A maternal mortality of 15 per cent. cannot be considered as higher than the average. In the clinics of Dresden, Halle, and Königsberg the mortality of eclampsia has been 30 per cent, 49 per cent., and 28 per cent., respectively. In the Leipsic clinic eclampsia occurred in frequency of 2.07 per cent., 80 per cent. of the cases being primiparæ and most of them occurring during the month of March. The mortality was 17.24 per cent. for the mother; for the children the mortality was 43.59 per cent. As causes of death, disorders of the liver and pneumonia, with edema of the lungs, were most fatal. All varieties of treatment were tried in these cases except Cæsarian section upon the living patient.

Treatment.—In the treatment of eclampsia many factors must be kept in mind. Evidently the immediate necessity is to rid the blood of the poisons whose presence keeps up the convulsions and threatens the mother's life. The removal of the fœtus is considered by many to be an essential element in treatment, and hence labor is to be expedited in every manner possible. In this, as in many other conditions which the obstetrician must meet, it is often not so much a question of what ought to be done as what can be done in the surroundings in which the patient is found. We believe that the most important indication is to secure elimination, and that next in importance comes the emptying of the uterus. In both of these convulsions must be controlled, because of their destructive effect upon the blood of the patient and also upon the integrity of the nervous system.

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[153] Bell: Journal of Obstetrics of the British Empire, September, 1902.

[154] Stroganoff: Monatsschrift für Geburtshülfe und Gynäkologie, Band 12, Heft 4.

[155] Bayer: Monatsschrift f. Geburtshülfe und Gynäkologie, 1899, Bd. 10, Heft 1.

[156] Knapps: Monatsschrift für Geburtshülfe und Gynäkologie, Band 3, 1900.

THE SECURING OF ELIMINATION.—The action of the liver, the bowel, the skin, and kidneys must be roused as soon as possible. If the patient can swallow, from 2½ to 10 grs. of calomel, with a convenient quantity of bicarbonate of soda, may be given at once. If the patient is unconscious and cannot swallow, if the physician can do so, he may wash out the stomach, introducing a stomach tube and using a funnel, place the calomel and soda within the stomach through the tube. If he cannot do this, he may place upon the tongue two drops of croton oil in one or two teaspoonfuls of sweet oil or glycerine.

To rouse the action of the skin, the patient may be placed in a hot pack at once, the lower extremities being wrapped separately to permit manipulation about the rectum or vaginal examination. At the same time that the pack is given, unless the patient's pulse is weak and rapid, she should be given a hypodermatic injection of 10 minims of tincture of veratrum viride. Should convulsions occur during this manipulation, they are best controlled by the administration of chloroform, freely diluted with air or with oxygen. While the pack is going on, the patient may be given saline fluid by hypodermoclysis, a pint or more being inserted into each side of the body in the connective tissue beneath the axilla or at the outer aspect of the thighs. The needle should be thrust sufficiently deep into the thigh to introduce the fluid below the superficial connective tissues. If the pulse is rapid, full, heavy, and very strong, the arm may be exposed and the patient bled from the arm and intravenous saline transfusion may be practised. From one to two pints of fluid may be introduced. In an emergency it may be remembered that one teaspoonful of table salt added to one pint and a half of warm water makes an available saline fluid for injection.

The patient should be catheterized while under control with chloroform, and the amount of urine noted and the specimen saved for examination. Introducing a soft rubber rectal tube as far as possible into the bowel, from one to two gallons of warm saline fluid should be allowed to run as high as possible into the intestine. Little of this may be retained at first, but the injection of the fluid should be continued and as much as possible should be left within the bowel. When the patient is put in the pack, her bed should be covered by a large tarpaulin or rubber sheet, so that discharges from the bowel may be removed without destroying the mattress on which the patient lies. It is well to use an abundance of old linen rather than to put the patient too frequently upon an earthen bed-pan during the treatment of these cases. The pack may be continued for one hour, and then the patient quickly, but thoroughly, dried and gently rubbed and placed between warm blankets. To guard against wounding the tongue during convulsions, a folded handkerchief may be placed between the jaws at the corner of the mouth, and a nurse or assistant should watch the patient, ready to administer chloroform when necessary and guarding against the wounding of the tongue. The hot pack may be repeated in from half an hour to an hour after the former pack, and the rectal injection and hypodermoclysis may be repeated at the same interval if the indications demand.

THE EMPTYING OF THE UTERUS.—At the beginning of the case a thorough abdominal and vaginal examination should be made to ascertain the condition of the fœtus and the signs of approaching labor. In cases where the cervix is tightly closed and but little shortened, no interference with the uterus should be practised. No good can be done by forcibly dilating the uterus against considerable resistance. If, however, it is found that the cervix is partly dilated, the membranes unruptured, and uterine contractions beginning, the obstetrician may choose one of two courses of treatment.

Disregarding the life of the fœtus, he may rupture the membranes, thus indirectly exciting uterine contractions, but diminishing the tension within the uterus in the absence of pains. The risk to the fœtus is greater by this procedure, but it is a simple method, and one available at all times.

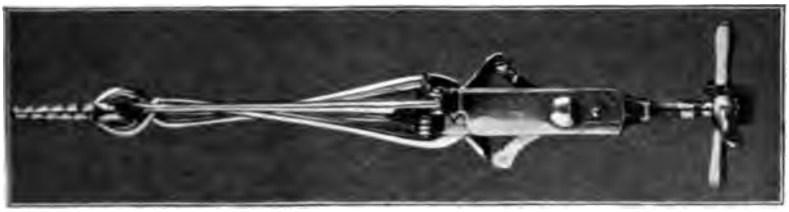
If, however, he has abundant assistants and is skilled in manipulation, he may introduce a McLean's bag or Barnes' bag of the largest size, or DeRibe's bag, and secure as much dilatation as possible with an hour's pressure by the bag, and then proceed to deliver the patient. The introduction of the bag should not be practised unless the physician is prepared within an hour or an hour and a half to terminate the case. Too long pressure by the bag excites convulsions and exhausts the patient. Bougies should not be inserted within the uterus to excite labor in eclamptic cases, because dilatation is too slow with this method and the bougie is an irritant.

When dilatation, either with or without the use of bags, is sufficiently advanced to permit the extraction of the fœtus, the case may be terminated under anæsthesia. If a physician accustomed to the use of chloroform can be secured as an assistant, he may administer chloroform well diluted with air. If a less skillful person is available, ether may be employed, carried to surgical anæthesia. The time chosen for delivery should be determined largely by the possibility of dilatation, and at the conclusion of the hot pack and eliminative treatment. The obstetrician should be prepared to fully dilate the cervix with his hand or by incision, to use forceps or perform version, to remove the placenta manually, to tampon the uterus with gauze, and to close lacerations in the cervix, pelvic floor, and perineum. Appliances should also be at hand for the resuscitation of the child.

The patient being anæsthetized, the operator proceeds to catheterize the patient, saving the specimen for examination. A thorough examination to determine the position and presentation of the fœtus should then be made, the cervix thoroughly dilated by the hand or by incision with large, blunt-pointed scissors, the cuts being carried nearly to the vaginal junction. If the membranes have not been ruptured, they should then be ruptured: and if the head is in a favorable position, the child should be extracted by the use of forceps. Should the position of the head not be favorable, version may be done. If the patient's pulse is rapid and full, a moderate quantity of blood may be allowed to escape from the uterus after the extraction of the child and during the removal of the placenta. The uterus should be thoroughly douched with hot lysol, 1 per cent., and should then be tamponed with iodoform gauze. Bleeding vessels in the cervix should be closed by catgut suture, and, if the patient's condition warrants it, lacerations in the pelvic floor and perineum should be rapidly closed. If her condition is desperate, this should be omitted. If the indications are present, intravenous transfusion may be performed before the patient rouses from the anæsthetic, and if the pulse shows the necessity for more fluid within the circulation, this is an especially valuable method of treatment.

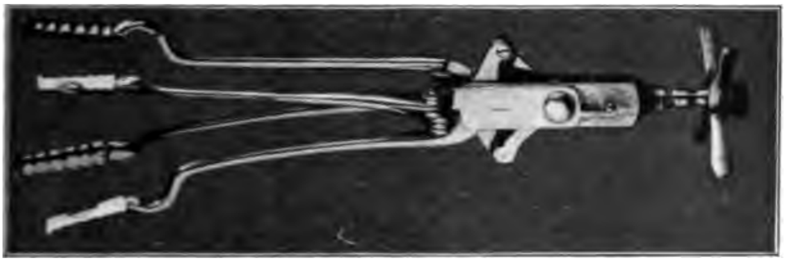
RAPID DILATATION BY BOSSI'S DILATOR.—By this powerful instrument almost complete dilatation of the cervix may be obtained in from thirty to forty minutes, the patient being anæsthetized. If necessary, the guards may be removed from the tips, and the instru-

FIG. 49.



Bossi's dilator closed. (From original photograph.)

FIG. 50



Bossi's dilator open. (From original photograph.)

ment introduced through an os admitting one finger only. Great care must be exercised in using the instrument, for serious laceration may result. Such tears should be closed at once by chromicized catgut.

The Treatment After Delivery.—A physician must not be deceived in supposing that convulsions will cease when the uterus is empty. The patient may pass into a condition of shock and depression requiring active stimulation. There is no objection to the use of strychnia under these circumstances. If the patient is restless and nervous and cannot sleep, it is well to give a hypodermatic injection of morphia with atropia. If the bowels have been freely emptied, and if the secretion of urine is becoming re-established, rectal injections containing one ounce of whiskey, two ounces of milk, and two ounces of warm water may be used for stimulation. Especial precaution should be taken during the treatment of these cases that the patient has abundant fresh air, and that mucus is wiped away from the mouth and nostrils as carefully as possible. No manipulation causing pain should be practised unless the patient is partially under the influence of an anæsthetic. If the services of skillful nurses are obtained, the giving of the hot pack and rectal injections will cause little distress.

Lactation After Eclampsia.—A woman who has had eclampsia should not nurse her child. The quantity and quality of milk in these cases is so altered that the milk is not suitable food for the child, while the condition of the mother is such that the irritation of nursing must be avoided. If the milk forms freely, it may be extracted from the breasts by pumping and discarded until the mother is convalescent. Should the secretion of milk persist when convalescence is assured, and artificial feeding not agree with the child, then the mother's milk may be utilized.

Delivery by Cæsarian Section.—The fact that the patient may be delivered under complete anæsthesia with the least possible pain and irritation has led to the employment of Cæsarian section in some cases of eclampsia. In discussing the results of this operation in eclampsia, it is but fair to consider Cæsarian section as a means of delivery only having, in good hands and under aseptic precautions, a small mortality, and thus comparing favorably with forcible dilatation of the uterus and forceps or version. Hillmann[157] collected 40 cases of eclampsia treated by Cæsarian section; 21 of the mothers perished and 19 recovered. Of the 41 children, 18 perished and 23 recovered. In 7 cases convulsions occurred after the operation. In 250 cases of eclampsia at his clinic, Olshausen[158] saw 3 only in which he considered Cæsarian section the most available form of delivery. From this and similar statistics, we may infer that, under the advantages of hospital care and with an experienced operator,

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[157] Hillmann: Monatsschrift für Geburtshülfe und Gynäkologie, Band 10, Heft 2, 1899.

[158] Olshausen: Centralblatt für Gynäkologie, No. 2, 1900.

Cæsarian section may be considered equally with forceps or version. If the patient be a primipara, with a cervix tightly closed, the fœtal heart-sounds good, and the mother in good condition, unquestionably, Cæsarian section is a quicker and less violent method of delivery than forcible dilatation of the cervix or incision of the cervix and the use of forceps or version. In cases where the patient has become weakened by many convulsions, where the child is premature or is not in good condition, and where the soft parts admit of dilatation or incision, Cæsarian section should not be chosen. In the writer's experience, the rapid removal of the fœtus through the abdomen sometimes causes great temporary improvement. In a case of eclampsia with contracted pelvis, and the patient in a moribund condition, the fœtus was extracted by Cæsarian section, supposing that the mother must inevitably perish within a few moments. The delivery of the child and the change in the mother's condition following the removal of the fœtus brought about a remarkable improvement in the circulation, with improved secretion and consciousness, which lasted for several days. The mother finally perished from exhaustion, autopsy showing the excretory organs in a condition of hopeless degeneration.

VAGINAL CÆSARIAN SECTION.—Dührssen[159] has extracted the fœtus in some of these cases by what he terms "vaginal Cæsarian section." Practically, this is an extension cf his method of opening the cervix by multiple deep incisions. He operates by pulling down the cervix, opening the vagina in its anterior wall, and pushing aside the tissue until the anterior wall of the cervix has been exposed as far as the internal os. He then opens the anterior wall of the cervix and the lower uterine segment bv incision and ruptures the membranes. The child is delivered by version, and the incision is enlarged if necessary to permit the birth of the head. The removal of the placenta is accomplished by the hand; gauze packing is used within the womb, and catgut stitches are employed to bring together the severed tissues.

TREATMENT BY THYROID EXTRACT.—Acting upon the belief that the essential cause of eclampsia is deficient metabolism, Nicholson[160] has administered thyroid extract to patients in eclampsia or threatened with eclampsia. His results were sufficiently satisfactory to justify further investigation in this direction.

The Differential Diagnosis between Meningitis and Eclampsia.—The cerebral irritation caused by meningitis may bring about a condition simulating very closely eclampsia. Wilson[161] reports a case admitted to the Birmingham Hospital in a comatose condition. The urine was highly albuminous, but had a high specific gravity and contained a considerable percentage of sugar. There were no casts or blood corpuscles, and there is no statement regarding the quantity of urea present. The patient was between six and seven months pregnant, had no edema of the lungs, but was suffering from a succession of convulsions resembling eclampsia. The case proved fatal. On autopsy, it was found that meningitis, caused by the pneumococcus, had produced the convulsions.

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[159] Dührssen: Archiv für Gynäkologie, Band 61, Heft 3, 1900.
[160] Nicholson: British Medical Journal, May 17, 1902.
[161] Wilson: Trans. Obstetrical Soc. London, Part 1, p. 5, 1902.

Neuritis and Neuralgia.—Polyneuritis following parotitis has been observed in pregnancy, with a fatal issue to mother and child. Its occurrence with parotitis points to a common cause of infection as producing the condition.

The increased reflex activity of the nervous system during pregnancy, demonstrated by Tridondani[162] and others, readily explains the susceptibility of the pregnant patient to neuralgia. The point of irritation is often in the teeth; next in frequency in the pelvis, and less commonly in other portions of the body. Facial neuralgia from diseased teeth is usually cured by local treatment. In the case of neuralgia of the pelvic nerves, the patient complains of pain radiating down the thighs, severe cramps referred to the inner aspect of the thigh, and accompanied by active fœtal movement and spasmodic contraction of the thigh muscles, frequently disturbing the patient's rest at night. In pelvic neuralgia a physician must assure himself that pressure of hardened fecal masses is not affecting the pelvic nerves. The thorough emptying of the bowel will often relieve these patients greatly. In cases where the uterus is displaced by pressure, exciting neuralgia, it is obviously necessary to replace the uterus to relieve the patient. The knee-chest posture may be used for the actual manipulation, and the womb may be kept in position by tampons of aseptic wool or packing the vagina about the cervix with strips of sterile surgeons' lint thoroughly saturated with sterile glycerine. The pressure of these strips and the action of the glycerine upon congested and adherent tissues lessens the fixation of the uterus and assists greatly in its final replacement.

Facial neuralgia, with hemicrania, often causes great suffering during pregnancy, for which no existing cause in decayed teeth can be discovered. Great changes in the weather, loss of sleep, and prolonged anxiety and depression tend to bring about this condition. When painful spots can be isolated, menthol or iodine may be applied locally or the skin over the painful spots may be sprayed with anæsthetic vapor. The patient should be put at rest, if possible, and protected from cold, and easily-digested food, with iron, arsenious acid, and quinine, should be administered freely. Alcohol serves a useful purpose in these cases until the patient's nutrition can be materially improved. It is a mistake to rely for any length of time upon sedatives and narcotics, as they impair the patient's nutrition and result in no permanent good.

Derangement of the Secretory Nerves.—Excessive secretion of tears or saliva forms a most annoying complication of pregnancy. Excessive perspiration occurs in some cases, and may accompany the conditions just described. In Neiden's case[163] the secretion of tears was so copious that eczema of the lids resulted, the eyes being constantly suffused. The reaction of the secretion was alkaline, and no cause was found in the condition of the eyes. Recovery finally followed the use of cocaine in 5 per cent. solution injected into the eye. In excessive salivation the bromides are sometimes of use, and may be applied to the mouth in a spray. The orifice of Steno's duct may receive an application of cocaine solution. Some patients obtain partial relief in excessive salivation through the free use of effervescing alkaline mineral water. In all of these cases the general health of the patient should be reinforced in every way possible, and a general neurotic condition should be recognized as constituting the essential element with these patients.

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[162] Tridondani: Annali di Ostetricia, No. 3, 1900.

[163] Neiden: Monatsblatt für Augenheilkunde, Band 29, p. 353, 1891.

Herpes.—This complication is most frequent between the third and fifth months of gestation, rarely during the latter months. In a few cases the disorder appears early in the puerperal state. It is apt to return in succeeding pregnancies, and affects the general health surprisingly little. Gestation is not interrupted by this complication, and the end of pregnancy usually brings about a prompt recovery. Herpes occurring after labor usually causes fever, with intense itching and perspiration. These phenomena precede the eruption. Unfortunately, herpes tends to return in succeeding pregnancies, and cases are on record in which a patient has suffered repeatedly from this complication. The child escaped this disorder. The disease attacks young women rather than older patients, and occasionally assumes a mixed form, which may resemble syphilitic eruptions.

Treatment.—Attention must be given to the general health of a patient suffering with herpes, as this is of primary importance. Iron, hypophosphites, arsenic, fats and oils, and a liberal diet are indicated. As local applications, boracic acid in various ointments, glycerole of starch, and olive oil and lime water may give comfort. After the coming of the eruption, bismuth or talcum with starch sometimes gives comfort. The itching may be partially relieved by the local use of weak solutions of carbolic acid, chloral hydrate, menthol or corrosive sublimate. Medicated baths may be used where a large extent of the skin is affected.

Herpes is an unfavorable complication of pregnancy, from its tendency to depress the general nervous energy of the patient. A guarded prognosis should be given, and such patients may be expected to come to labor in much below the average condition.

Affections of the Brain.—Cerebral hemorrhage forms a most dangerous complication of the pregnant condition. This usually follows the occurrence of infection in some other part of the body, multiple thrombi being carried into the cerebral circulation. These thrombi may have their origin in the pelvic viscera in cases of septic infection following abortion, placenta prævia, or labor at term.

The membranes of the brain may also become infected from a preexisting focus during pregnacy. In view of the very high mortality for mothers, labor should be induced in these cases if the fœtus is viable. The child has survived the mother with some of these patients, and the effort should be made to save its life.

The treatment of this condition is essentially that employed in the non-pregnant. Cerebral complications may be expected in all cases of pregnancy or labor in which severe hemorrhage or septic infection occurs.

Pregnancy Terminated by Sudden Death.—An enlarged condition of the uterine sinuses makes possible the sudden death of the patient by the entrance of air into these vessels. In cases of criminal abortion, brought on by the injection of fluid within the uterus, this accident has been observed. The occurrence of sudden respiratory and cardiac failure has been seen with patients greatly depressed by pernicious nausea, or who have been much weakened by intense pain. Such patients show peculiar susceptibility to morphine, especially when given by hypodermatic injection, and the use of this drug in pregnancy calls for the exercise of great caution. Profound mental depression during pregnancy, with definite foreboding, may be followed by death soon after delivery. In a case under the observation of the writer, a young woman illegitimately pregnant had been told by a fortune teller that she would certainly die so soon as her child was born. She was delivered by the use of forceps, and but little shock followed the termination of gestation. During the next few hours, in spite of free stimulation, cardiac clot occurred, followed by the death of the patient. In this case the profound mental dread depressed the heart to an extraordinary degree. Embolism of the pulmonary artery may destroy the patient immediately after labor or as late as the third week of the puerperal period. Labor itself may cause the separation of pleuritic adhesions or the rupture of abdominal abscess. Patients suffering from lesions of the heart are not especially in danger of sudden death, provided compensation be well established and the patient be given careful attention during labor.

Maternal Impressions.—It has long been believed that a severe fright or shock occurring in pregnancy might not only seriously influence the mother, but leave its impress upon the unborn fœtus. Children have been born supposed to resemble an animal by which the mother while pregnant had been frightened. Pregnant women have seen mutilated persons, and the fœtus has shown at birth a corresponding mutilation.

The study of embryology has thrown considerable doubt upon the causal relationship of the shock to the nervous system in these cases. Malformation of the fœtus must be caused by some interference with the natural development early during gestation. Most of these cases must be considered as examples of coincidence rather than cause and effect. It is, however, possible to interfere greatly with fœtal development by disturbance and shock to the patient, and this must be kept in mind in dealing with pregnant women.

Some striking examples of malformation in pregnant animals confirm the belief that maternal fright may produce deformity in the human offspring.

The writer was presented by Dr. George W. Spencer with a specimen, the head of a fœtal pig. In contour this resembles plainly the head of an elephant, while from the forehead projects an appendage closely resembling an elephant's trunk. This specimen was obtained by Dr. Spencer's father, a physician, under the following circumstances:

A gravid sow was greatly frightened by a circus parade in which several elephants were a principal feature. The sow rushed in great alarm into a stable and hid persistently from the sight of the procession. When the litter of pigs was born one showed the curious malformation described, and was obtained as a specimen.

The Influence of Pregnancy upon Hysteria, Chorea and Epilepsy.—It has been supposed that the physiological stimulus of pregnancy acts as a curative in some of the psychoses and nervous conditions which may affect the pregnant woman. Tarnier[164] believed that hysteria is not benefited by pregnancy, but, on the contrary, is aggravated by this condition. Abortion and premature labor are rarely caused by hysteria. The epileptic patient seems occasionally better during pregnancy. This may result from the cessation of menstruation, as epileptic attacks are usually more frequent at the time of menstruation. In one-fourth of cases epilepsy is aggravated by pregnancy, and occasionally a fatal issue follows a series of convulsions. One of the most dangerous neuroses of pregnancy is chorea, which Tarnier credits with a mortality of 30 per cent. and a morbidity of 20 per cent. of abortion and premature labor.

Chorea.—Pregnancy aggravates chorea more than any other disease of the nervous system. Choreic movements may involve the uterus, threatening premature labor. McCann[165] divides these cases into the true, the hysterical, and a mixed type of chorea. These patients are usually young, and most of them primigravidæ. Most cases are worst during the third and fourth months of pregnancy, probably because fœtal movements begin at this time. Pre-existing epilepsy or hysteria follows the development of chorea during pregnancy, as do profound emotion and anæmia. In fatal cases the motor and intellectual centres and cord are involved; in mild cases the motor portion of the brain only.

Diagnosis.--Many choreic patients are hysterical, and many hysterical patients become choreic during pregnancy. Cases may be recognized by the character of the movements and by the marked lessening of sensibility which is seen in hysterical patients. A previous history of hysteria may often be elicited. A physician must be on his guard to detect simulated movements, which occasionally deceive skilled observers. Chorea affecting pregnant patients is usually bilateral, beginning upon one side and then extending to both. Such patients have a peculiarly stupid expression, the muscles of the face causing grimaces. The pupils are often dilated, the muscles are relaxed, and mental apathy is often present. In most patients the face is affected, and speech and movements of the tongue also. Choreic movements are usually bilateral, although they may be unilateral in the beginning. In maniacal chorea the patient may become excessively violent, but the prognosis for recovery is more favorable as regards the mental condition than in true mania complicating gestation.

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[164] **Tarnier:** La Presse Medicale. 1897. No. 29.

[165] **McCann:** Transactions London Obstetrical Society. Vol. 33. 1891.

Irritation arising from the fœtus or from the occurrence of lactation may often be recognized as the immediate cause of choreic movements. The pains of labor often cause choreic movements to cease temporarily. Thus labor in a choreic patient may be normal, followed by a temporary lull in choreic movements, until the effort to expel the placenta excites the patient to fresh motion. During the puerperal state distention of the breasts and the irritation accompanying the formation of milk produce an exacerbation of chorea. Purgation during the puerperal state also causes renewed choreic movements. With some the child's nursing causes such violent movements that the nipple is jerked from the child's mouth.

Complications.—Endocarditis is not infrequently seen in these cases, and is an added element of considerable gravity. Anæmia and accompanying conditions are often present with these patients. Examination of the urine shows increased phosphates and urea as the result of violent muscular contraction. Hysterical may be differentiated from non-hysterical chorea by the fact that in the former the movements are never so violent, while the conscious hysterical element may be recognized. Although great disturbance of the mind may complicate chorea, a diagnosis is made by the characteristic movements.

THE FŒTUS IN CHOREIC CASES.—Children born of these parents often exhibit a tendency to convulsive movements. They occasionally share the mother's anæmia, which persists for some time after birth.

Treatment.—While temporary improvement follows the administration of sedatives and narcotics, permanent results are not obtained in this way. The mother should secure as much absolute rest as possible, and should have the advantage of the best nursing. If there is great mental depression, the patient's external surroundings should be completely changed. Arsenic, remedies to improve digestion, and a carefully-selected diet are of primary importance. The skin may be gently stimulated by bathing and light massage. The habit of wakefulness may be broken by the administration of hypnotics in moderate doses. Some have used strychnia to its physiological effect, with reported good results. Improvement has followed the use of salicylate of sodium, wet packs, and the application of cold to the spine. When these patients are delivered, hemorrhage must be prevented, as the patient's anæmia prohibits further blood loss. Violent movements during the third stage of labor make it difficult to control the uterus. The weakened state of these patients makes them susceptible to septic infection.

THE TREATMENT OF CHOREA DURING THE PUERPERAL STATE.—If chorea persists after labor, the child cannot be nursed. The same tonic treatment should be continued during the puerperal state which was advised for the pregnant condition.

THE INDUCTION OF LABOR IN CHRONIC CASES.—Unquestionably, in severe cases, which do not promptly improve, pregnancy must be terminated. When the movements are so intense that the mother is threatened with exhaustion from muscular activity and loss of sleep, when the mental condition is greatly disturbed, and when some grave physical complication is present, the induction of labor is indicated.

Catalepsy and Hysteria.—Catalepsy is among the rare disorders of the nervous system occurring in the pregnant condition. It may occur in apparently strong and well-nourished patients, cataleptic fits taking place several times daily, with intervals of varying length.

Hysteria illustrates the fact that pregnancy increases rather than cures a pre-existing defect in the patient's nervous organization. The belief that hysterical women are cured by marriage and pregnancy is an evident mistake. Hysteria may take, during pregnancy, the form of mild melancholia, with great fear of the approaching parturition. At other times the emotional element is in excess. These cases become dangerous only when they pass into a condition of active mania, exhausting the patient, or when they bring about a condition of anorexia and constant fear, which causes great debility.

Treatment.—In dealing with these patients a firm mental atmosphere should be created for them, and every effort should be made to place them in the best possible physical condition.

Mania.—Pregnant women who have a distinct heredity of insanity may pass into the condition of mania during gestation. Those of unstable mental organization may be made maniacal by a great shock or sudden and severe tax upon the strength.

Diagnosis.—The diagnosis of this condition requires differentiation between mania and hysteria, hystero-epilepsy, the temporary results of toxæmia, and delirium tremens. A thorough study of the patient's excretions will show that toxæmia is not present.

Prognosis.—The prognosis will depend upon the absence of heredity in the patient and upon her previous physical health. In cases where an acute cause is present, the removal of this cause, with careful nursing and change of scene, is usually followed by recovery. In cases with bad heredity the prognosis is exceedingly grave.

Treatment.—These cases should be treated by putting the patient in a thoroughly good physical condition, and by constant and unremitting nursing. The tendency to melancholia and self-injury and injury to the fœtus is so great that these patients should never be left alone. During labor insane women manifest extraordinary indifference to suffering. They often give no sign that labor is in progress, and require very careful watching. At the time when the fœtus is expelled they should be anæsthetized, for they frequently become unmanageable at this moment and may inflict great harm upon the child or upon themselves. An insane mother should not nurse her child unless her mania is temporary and passes away after the birth of the child. If she improves greatly after parturition and natural affection for the child develops, it may be a powerful element in her recovery to have her nurse the child if she is physically able to do so. The element of toxæmia must not be neglected in these cases, for many patients improve surprisingly when carefully nourished and made to eliminate thoroughly. After labor, active mania may depress the patient by exhaustion, complicated by high temperature. In some of these cases septic infection may develop through the unmanageable condition of the patient at the time of labor. In other cases the fever seems to be the result of gradual failure of the nervous centers. While we do not see mania directly transmitted to the infant, the child's nervous system is imperfectly nourished in these cases, and it requires especial attention to bring it to a healthy condition.

The Effect of Poisons upon the Nervous System.—Pregnant patients who, by reason of occupation, are exposed to lead, tobacco, dye-stuffs, arsenic, or other irritant materials used in manufacture, may show the effects of these substances upon the nervous system.

Multiple neuritis is the lesion commonly present. The site of the neuritis is usually in those nerves supplying the upper extremities and the upper portion of the body. Hyperesthesia of the organs of special sense is usually present, and hysteria may be grafted upon the neuritic condition present. The secretions may be altered by the absorption of irritant material, while the nutrition of these patients is very greatly disturbed. Obviously, no cure can be found for such a condition except the withdrawal of the patient from the presence of the poisonous material.

Pruritus.—One of the most annoying complications of pregnancy referred to the nervous system is pruritus, usually limited to the vulva and vagina. As many of these cases accompany diabetes, the urine must first be examined to exclude, if possible, this condition. When sugar is present in the urine, the patient's diet and treatment must be directed to lessening its quantity or removing it entirely. All abnormality in excretion should be remedied if possible, and the patient put upon a carefully-selected diet.

Local Treatment.—Numerous local applications have been made in these cases. Of first importance is a thorough cleansing of the parts, followed by the application of antiseptic solutions. The free use of hot water and soap, followed by rinsing with warm water and the application of bichloride of mercury, 1-1,000, immediately followed by salt solution or warm water only, will frequently greatly relieve the intolerable itching present. Starch and laudanum or lead water and laudanum may be applied if there is extensive excoriation and breaking of the skin. An ointment of belladonna, opium, and iodoform frequently gives these patients much comfort. In some cases nitrate of silver in pencil may be applied to the mucous membrane with advantage. The most successful treatment for the greater number of these cases consists of careful and thorough cleansing by copious but gentle irrigation with dilute antiseptic fluid, accompanied by constitutional treatment addressed to the patient's nutrition and excretion, and also to the general nervous system.

Pernicious Nausea.—The majority of women pass through pregnancy without nausea and vomiting. From 10 to 20 per cent. have pronounced disturbance of the stomach during the first three months of pregnancy, while a small percentage have well-marked nausea, which lasts through the entire gestation. The unstable condition of the nervous system in pregnancy predisposes to irritability of the stomach, while the growing womb affords a mechanical cause for disturbance of the abdominal sympathetic. Evidently only those patients in physiologically good condition escape some disturbance of digestion during pregnancy.

Causes.—The most important predisposing cause for the pernicious nausea of pregnancy is found in an irritable condition of the nervous system, either congenital or acquired. This produces exaggerated response to reflex stimuli, which may themselves be normal. Anatomical variations from the normal in the generative tract, as malformation or dislocation of the pregnant womb, also predispose to pernicious nausea.

The exciting causes are toxæmia, any profound irritation or shock to the nervous system and infection attacking the nervous system, altered states of the bloodvessels supplying the pregnant uterus, irritant poisons absorbed affecting the blood and thus irritating the nervous centres, excessively violent movements of the fœtus, and exaggerated peristalsis in the mother's intestine. Abnormal distention of the bladder and rectum are frequently present in these cases.

Diagnosis.—The diagnosis of the severity of this condition is often difficult, because the physician must rely for information upon the statement of the patient or her friends. As the disorder proceeds and the patient becomes weak and anæmic, physical examination gives positive knowledge; but in the early stages a patient may exaggerate or conceal her condition. It is often necessary to place the patient under the care of a nurse, and to have a careful record kept of the quantity of nourishment taken and retained to form an accurate idea of her condition.

In mild cases the raising of the head from the pillow is followed by nausea and emesis, usually without straining or retching. This may be repeated several times during the forenoon. As midday approaches nausea ceases, appetite returns, and the patient may eat with relish. The matter vomited by these patients is mucus, usually strongly acid, occasionally of neutral reaction. These patients sometimes become nauseated at any portion of the day when subjected to sudden fright or to sudden excitement of the nervous system.

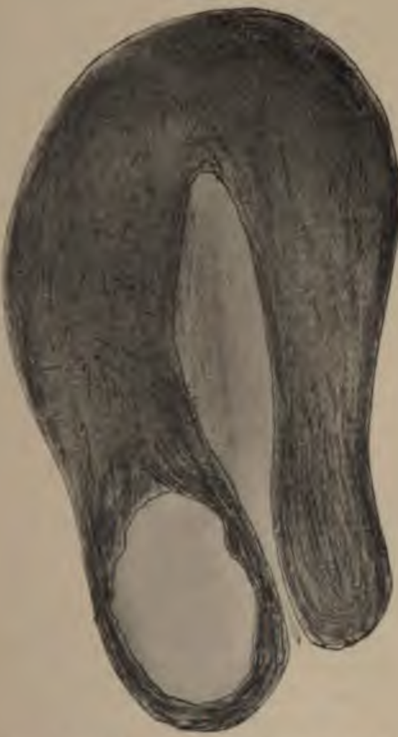
In severe cases the sensation of nausea begins so soon as the patient awakes. At any time while awake the patient rejects anything taken into the stomach. Any posture but the recumbent one increases the patient's nausea, and is followed by partial or complete syncope. Emesis relieves the patient but little, if at all. Matter ejected is mucus, often very acrid and very sour. Anything which suggests food increases the nausea ,and any disturbance of the patient has the same result. As the patient progresses, straining and retching become more severe. Anaemia develops in many cases with emaciation; in some with fatty degeneration, which maintains apparently the bulk of the tissue. Cravings for different articles of diet give no relief. The fauces are dry or salivation is profuse. As vomiting becomes severe, food, mucus, bile, mucus stained with blood and decomposed blood, coffee-ground vomit are ejected. Occasional relief from nausea is followed by great desire for food, but no sooner has the patient eaten than she vomits. Great distress, with indefinite pain, are located by the patient beneath the sternum. Some describe it as smothering, while in most cases it has nothing to do with breathing. In severe cases it is worse at night. Pernicious anaemia soon manifests itself with hematogenic jaundice, sordes, and purpuric extravasations. The urine contains the *débris* of the blood, the bowel movements are dark and often very offensive, the mucous membranes of the body are dark red, while the patient lies apathetic or has low delirium. Necrosis of the cornea, with dimness of vision, are sometimes seen. The heart fails through implication of its muscle, and the pulse is weak, soft, and rapid. Fatal cases often end in cardiac syncope. The temperature is at first subnormal, then fever occurs as a fatal termination approaches. There is no distinct involvement of the lungs, and irritant cough is frequently produced by a dry state of the fauces, or sometimes by excessive mucus. Abdominal examination may reveal the uterus in an abnormal position, and in many cases the abdominal muscles are so irritable that examination is difficult. As the liver undergoes fatty degeneration it becomes enlarged, the reflexes of the nervous system are increased, although the usual nervous stimulus of health is lacking. Except in purpuric cases, the nutrition of the skin is fairly well maintained, and with patients who are well nourished bed-sores are not common. The skin is often relaxed, and clammy sweat may be present.

Symptoms of Improvement.—When a patient suffering from pernicious nausea of pregnancy improves, nausea steadily diminishes, the patient is able to take and retain food, the excretions are increased, and especially the urine, sweating grows less, the patient sleeps for a considerable time without rousing, and the pain felt beneath the sternum, especially at night, disappears. There is a gradual fall in the pulse until it is less than 100, while the temperature, if subnormal, rises to normal. Coffee-ground discharges from the stomach and intestine cease.

Threatening Symptoms.—When a patient in this condition grows worse, nausea is incessant, vomiting is frequent and severe, the patient's strength suddenly fails, and pernicious anæmia declares itself. A persistently feeble, rapid pulse, pain and distress beneath the sternum, and coffee-ground discharges are important symptoms.

Pathological Anatomy.—Two pathological conditions are present in these cases—first, that pertaining to the pelvic organs, and, second, that which is found in the other portions of the patient's body.

FIG. 5'.



Vertical section of uterus, showing cyst in posterior wall of cervix. Fatal case pernicious nausea.

In the pelvic viscera the uterus may be displaced, its abnormal position causing irritation by pressure upon adjacent organs. Retroversion is the most frequent of these conditions, sometimes following straining or lifting, and sometimes accompanied by adhesions of the tubes and ovaries. In proportion as inflammation is present, the condition becomes severe, and its treatment a difficult matter. In uncomplicated cases of retroversion the uterus is readily replaced, and the patient immediately relieved by the correction of the dislocation.

Not infrequently the uterus, instead of being displaced backward, is forced downward and forward, resting with the fundus against or very near the symphysis pubis. In many cases the wearing of tight clothing has undoubtedly had much to do with the condition. Cases of marked congenital anteflexion, with very dense and resisting cervix, are often among this class. The unnatural position of the uterus in these patients causes an irritable state of the pelvic viscera, sometimes appropriately termed "pelvic tenesmus."

Abnormal growths in the uterus and tubes and ovaries have also been found in some of these cases. Endometritis from different causes is occasionally present. In one of the writer's cases[166] syncytioma malignum, with metastases in the brain and other viscera, caused pernicious nausea, for which the uterus was emptied. In this case the womb was entirely normal, and the termination of the pregnancy produced very little relief. Vomiting ceased, but the malignant growth soon terminated the patient's life.

Cancer of the stomach, chronic gastritis from gout, the use of alcohol or arterio-sclerosis, various forms of nephritis, brain tumor, continual dislocation of the stomach by pathological conditions in the abdominal viscera, hysteria, acute yellow atrophy of the liver, accompanied by vomiting and emaciation, may cause pernicious nausea in pregnant patients. Multiple neuritis, especially well marked in the phrenic, pneumogastric, median, and peroneal nerves, has been found among these patients. This condition was accompanied by essential changes in the blood corpuscles, and also in the epithelium of the kidneys, the latter of a fatty nature. The fœtal organs in these cases sometimes show evidence of fatty degeneration. The entire picture is that of a toxæmia.

Treatment.—It is of the utmost importance in these cases that a thorough diagnosis be made, and that the exact condition of the patient be ascertained. Confusion may arise from the exaggerated statements of the patient, who may not intend to deceive, or in some cases who may purposely give undue importance to her suffering with the hope that the physician will bring about abortion. Hence, in treating these patients, they should be examined with all fairness and be carefully observed.

The pelvic organs should invariably be examined in these cases; if the patient is excessively nervous and sensitive, and if she is still in good condition an anæsthetic may be used. The size, position, and consistence of the uterus must be accurately determined. A positive diagnosis of pregnancy should be made, for occasionally, in women who fear illegitimate pregnancy, fear causes pernicious nausea. The presence of a uterine or other pelvic tumor should be ascertained, and also the degree of impaction to which the uterus is subjected and the tense or relax state of the pelvic tissues. Accompanying the examination of the pelvic organs, the thoracic viscera and the abdominal viscera should also be examined. It is especially important in these cases that the blood receive careful attention, and also the urine. In rare instances an examination of the eye grounds give suspicion of cerebral tumor or of severe toxæmia or nephritis. During the examination the physician must keep in mind hysteria as a possible cause, and must study the patient closely for manifestations of this condition.

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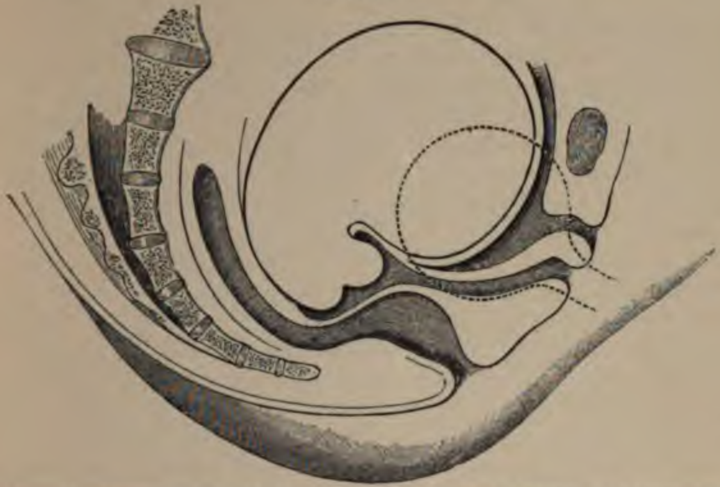
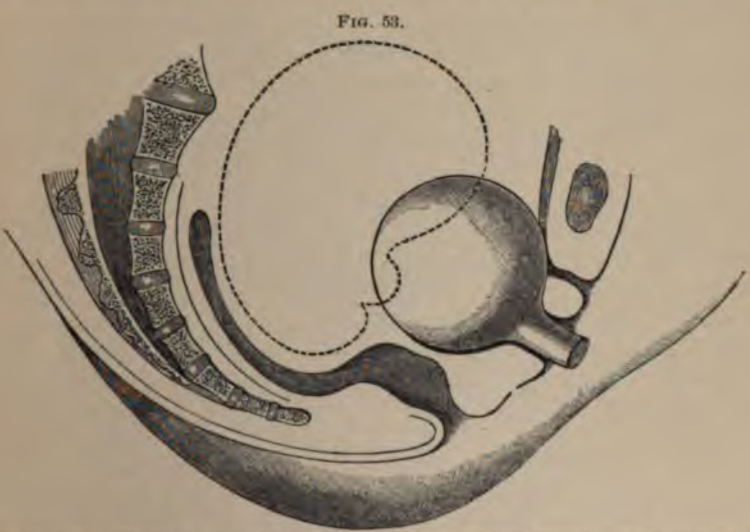
[166] Davis and Harris: American Journal of Obstetrics, July, 1900.

FIG. 52.



Treatment pernicious nausea, anterior impaction of uterus. Diagram of a supposed section of pelvis with an anteflexed impacted gravid uterus at about three and a half months. Dotted outline indicates air-ball pessary's position. (See next figure.) (HEWITT.)

FIG. 53.



Representing alteration supposed to be effected in position of uterus in foregoing figure by the action of the air-ball pessary. The alteration is represented by the dotted outline. (HEWITT.)

In active treatment the abnormality in the pelvic organs must first be remedied if possible. If the uterus is retroverted, but is not adherent, the patient should be placed in the knee-chest posture and the uterus gently restored to a position above the brim of the pelvis. If adhesions are present, the patient may be turned upon her left side, the pelvic floor retracted by Sims' speculum, and the posterior portion of the vagina thoroughly tamponed with aseptic wool, anointed with a boracic acid ointment, or, for tampon, a strip of sterile lint soaked in sterile glycerine may be used. If the uterus is adherent, some time will be required for its replacement, and during this the vagina should be irrigated with lysol, 1 per cent., when the tampon is changed. If the uterus goes readily into position without adhesion, it should be retained by a suitable pessary having a large and soft posterior bar.

When the uterus is anteverted or anteflexed and forced downward into the pelvis, the patient's hips should be raised, the bladder emptied by catheter if necessary, and the uterus should be gradually elevated by the use of tampons of aseptic wool with a mildly antiseptic ointment. All pressure by clothing must be removed, and if the patient is in bed she should lie with the hips elevated. Marked improvement follows raising the uterus in this manner.

If pelvic tumor be present, it may be necessary to remove it by abdominal or vaginal section. Myomectomy, ovariotomy, appendectomy, and the removal of the tubes, if diseased, are justifiable expedients in these cases.

Where the cervix is found by inspection to be swollen with its mucous membrane in a red and angry condition, considerable benefit is usually obtained by applications of nitrate of silver or tincture of iodine, followed by tampons of cotton with glycerine. Should the cervix have been previously torn and be much enlarged and degenerated, its amputation would be indicated. Dilatation of the cervix to relax its tension may be tried in cases where other local treatment is unsuccessful. It is best to anaethetize the patient at least partially for this, and to use solid dilators, carrying the dilatation to a moderate degree only. The continued use of the air-ball pessary described by Hewitt[167] is also of value.

The general treatment of this condition must be conducted largely by skillful nursing, absolute rest and seclusion for the patient, and by a consistent and firm mental control of the case. Drugs are of little, if any, value with these patients. A warning must be given against the persistent use of cocaine, morphine, hydrate of chloral, and any of the depressing anaesthetics or sedatives. If the patient is in fair condition, it is best first to rouse the excretory organs to activity. Small doses of calomel, followed by mild salines given in purgative enemata and by hypodermoclysis, or by the mouth, are useful to relieve the patient from the toxaemia which is generally present. There is no remedy which will control the distressing sensation of nausea without profoundly narcotizing the patient. Occasionally the use of bromides seems to cause some improvement. In mild cases simple tonics, as gentian and cardamon, addressed to the stomach exert a favorable influence. When exhaustion threatens, strychnia hypodermatically with digitalin are indicated.

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[167] Hewitt: "Severe Vomiting during Pregnancy," London, 1890.

The patient must be thoroughly and carefully nourished by every means known in the art of medicine. If she is not disturbed or exhausted by gentle rubbing, inunctions of olive oil may be given once or twice daily. At first the patient should take nothing in the stomach except water in sips. Her nourishment should be exclusively by the bowel. For this purpose we have found the following enemata useful:

1.	Beef-tea	3 ounces.
	Yolk of 1 raw egg	
	Brandy	½ ounce.
	Liquor pancreaticus	2 drams.
2.	1 whole raw egg	
	Table salt	15 grains.
	Peptonized milk	3 ounces.
	Brandy	½ ounce.
3.	Beef-tea	2 ounces.
	Brandy	½ ounce.
	Cream	½ ounce.
4.	Beef-tea	2 ounces.
	1 whole raw egg	
5.	Beef-juice	1 ounce.
6.	Beef-essence	6 ounces.
7.	Whites of 2 raw eggs	
	Peptonized milk	2 ounces.
	2 eggs	

While this treatment is in use, the bowels should be irrigated once daily with sterile water or normal salt solution. Especial care should be taken to boil tubes and catheters thoroughly and to maintain them in an aseptic condition. If the patient improves, the stomach may cautiously be tried with small quantities of peptonized milk, freshly-made broth, beef-juice, gruels, and white of egg water. In favorable cases the patient is gradually able to retain solid food.

As the patient is losing strength, the body must be kept thoroughly warm. Abundant fresh air is necessary, but the patient may be wrapped with flannel or hot-water bottles kept about the limbs or at the back of the neck. Sunshine is always of advantage, provided it does not fall directly upon the patient's face. The bowels may be emptied by irrigation with normal salt solution once daily, which not only removes fecal matter, but also keeps the mucous membrane of the rectum in good condition. Attention should be paid to the nutrition of the skin over bony prominences, and care taken that bed-sores do not develop.

It is of the utmost importance that the patient be entirely secluded from all irritation and anxiety, and that a kindly and hopeful mental influence surrounds her. No mention should be made of vomiting, or nausea, or food. The odor of food should not enter her room, nor should a basin be in readiness for her vomiting. Accurate records should be kept of the exact quantity of food given and retained, and also of the excretion and hours of sleep. A summary for each twenty-four hours should be furnished to the physician for his comparison. A temperature chart is also necessary, as the patient's temperature sinks if she does badly. It is only by close study of accurate data that the real progress of a patient toward recovery or failure can be ascertained.

While washing out of the stomach has been followed sometimes by good results, it is seldom of permanent value. In cases where chronic catarrh of the stomach is present, lavage with normal salt solution or sodium bicarbonate solution may be cautiously tried. Hypodermoclysis is of considerable value, as it assists in preventing toxæmia and sustains the pulse. The use of the faradic current over the solar plexus and cerebellum has seemed to help some cases. In procuring sleep, the rectal injection of alcohol stimulus at night is often the best available resource. A patient may take several ounces of whiskey or brandy to advantage, usually causing slumber. It is most important that the physician avoid the use of hypnotic drugs as much as possible.

Termination of Pregnancy.—When, under careful nursing and accurate observation, the patient is distinctly failing in strength, the termination of pregnancy becomes the physician's duty. This responsibility should be shared, and no doubt should be left in the minds of all concerned regarding the propriety of this procedure. The induction of abortion should be declined, because experience has shown that this method is unreliable and frequently accompanied by bad results. The uterus should be completely emptied at one time and under anæsthesia. That the operation may be successful, the operator must take carefully into account the condition of the patient. Many of these women are so exhausted by prolonged nausea that even anæsthesia is depressing, and may be dangerous. Where there is extreme rigidity of the cervix, the relaxing influence of chloroform is desirable, and yet the patient's weak heart action may make its use more than usually dangerous. Under these circumstances, chloroform may be administered combined with oxygen if the services of a skilled anæsthetist, who is accustomed to its employment, can be obtained. If such is not the case, then ether should be selected, and should be given cautiously, freely mixed with air. It is well to be prepared to use intravenous saline transfusion during the operation.

Under strict antiseptic precautions, with the patient in the dorsal position with the limbs flexed, the posterior vaginal wall and perineum are depressed, the cervix is grasped by tenaculum forceps and the uterus drawn gently downward. Before commencing to operate, it is well to make a thorough bimanual examination in all cases of pelvic disease while the patient is relaxed by ether. If possible, dilatation should be performed by solid bougies, but if difficulty is found in their use, a bladed dilator may also be employed. When dilatation has reached the point permitting the introduction of the index finger, the uterus should be thoroughly explored, if possible, and the location of the ovum accurately determined. It should then be removed and the uterus thoroughly curetted by a curette having a moderately sharp edge, which will bring away not only the embryo, but the uterine decidua. Following this, the uterine cavity should be thoroughly flushed with normal salt solution or lysol, 1 per cent., and the uterus should be packed with gauze containing 10 per cent. of iodoform. The womb should then be carried as high as possible in the pelvis, and should be anteverted and retained in place by a vaginal tampon of dry bichloride or sterile gauze. Hemorrhage during or after this operation, if packing be used, is rarely considerable. Should persistent oozing occur, the gauze may be removed and another strip introduced powdered with iodoform and tannic acid, equal parts.

This procedure terminates the nausea, and patients express the greatest relief upon awaking from the anæsthetic. Whether or not the patient will recover will not depend upon the termination of the nausea, but upon the presence or absence of fatal exhaustion. Weakness must be combated with hypodermic doses of strychnia, with rectal injection of whiskey and normal salt solution, with the elevation of the foot of the bed, the external application of warmth, and as soon as possible the administration of food and stimulus by the mouth. These patients do not suffer especially from nausea caused by the anæsthetic, and are often able to retain nourishment within an hour after they become conscious.

The gauze should be left for forty-eight hours, and then removed and the vagina and cervix cautiously douched with lysol, 1 per cent., or normal salt solution. No further douching should be practised. The patient should be carefully fed at first upon a liquid diet composed largely of milk, and the mistake must not be made of overtaxing the digestive organs. Arsenic, iron, gentian, and nux vomica are of great value in promoting convalescence. Massage is exceedingly useful in securing a prompt general and local recovery. So soon as the patient can spend a considerable time in the open air she will improve more rapidly. During convalescence especial attention must be paid to the condition of the nervous system and of the excretory organs. Both should be placed in the best possible condition, and the patient should be encouraged to believe that subsequent pregnancy need not end disastrously. Close study of such a case will often enable the physician to suggest essential changes in the hygiene and mode of life which may be of great subsequent value.

Pernicious Nausea in Multiple Pregnancy.—It is an interesting observation that patients sometimes have pernicious nausea in multiple pregnancy who are free from this complication when the pregnancy is single. In the writer's experience, he was obliged to interrupt a pregnancy for pernicious nausea, and upon curetting removed two fœtuses. The patient has had several pregnancies, two of which have been twin. In each multiple pregnancy she has had pernicious nausea and has lost the products of conception. In the other pregnancies she has gone safely to full term.

Pseudocyesis (Phantom Pregnancy).—Pseudocyesis, false or phantom pregnancy, is a neurosis. It usually affects patients desirous of offspring, or sometimes those who fear illegitimate pregnancy. In some patients it is associated with disease of the thyroid gland. In others thyroid disease and obesity are present.

Menstruation may or may not be disturbed in these patients. If it continues regularly, the amount may be considerably lessened. The abdomen steadily enlarges in size, the patient thinks that she feels the movements of the fœtus, there are abnormal sensations in the breasts, they may enlarge and fluid may be present. In fact, all the subjective signs of pregnancy may be fully described by the patient.

On examination, the objective signs of pregnancy are wanting, there is no discoloration of the vagina or vulva, nor are the blood-vessels of the genital tract enlarged and pulsating with increased force, as in pregnancy. The characteristic changes in the cervix are not present, nor is the body of the womb enlarged in a typical manner. As some of these cases occur in women who have borne children, and who are suffering from subinvolution or in patients in whom the womb is large and flabby by reason of a general failure in the muscular tone of the body, the uterus may be found larger than normal, but the shape and manner of the enlargement are distinctly different from that of pregnancy. On examining the abdomen it is observed that the abdominal enlargement largely disappears upon pressure, while there is often abnormal resonance over the entire abdomen. In some cases the abdominal wall is excessively fat, the breasts are without the characteristic changes of pregnancy, although they are often more large and flabby than normal, and a watery fluid may be present. In many cases the thyroid gland is very evidently enlarged, anæmia is not uncommon in these cases, and abnormal excretion is very frequently present.

No evidence whatever of the existence of the fœtus can be elicited. There is no fœtal heart-sound, nor can the shape and position of the fœtus be detected, nor can the examiner find evidence of fœtal motion.

Treatment.—The treatment of the condition is often an unpleasant thing for the physician, for his statement that pregnancy is absent is frequently received with incredulity and nothing but demonstration of the absence of pregnancy is conclusive. Fortunately, the positive diagnosis and the cure are the same, namely, examination of the patient under an anæsthetic in the presence of a responsible relative or some other reliable person. As anæsthesia proceeds the abdominal tumor disappears, bimanual manipulation enables the physician to grasp the uterus between the two hands and demonstrate the fact that it is not enlarged. The effect of anæsthesia upon the patient is curative as a rule. If active purgation precedes or follows the use of the anæsthetic, a better result is usually obtained. In patients in whom disease of the thyroid exists, the administration of thyroid extract is often followed by the occurrence of pregnancy, and thus by a permanent cure. In patients in whom deficient excretion is present, appropriate treatment brings about, incidentally, an improvement in the state of the nervous system, and hence a cure of the pseudocyesis. The attention of the physician must be directed to the possibility that in some cases immoral women may accuse men falsely. In these cases it will be found that the illegitimate pregnancy is not present, and that the patient is intentionally counterfeiting its symptoms.

CHAPTER XVIII.

THE ACUTE INFECTIONS COMPLICATING PREGNANCY.

THE increased burden upon the patient's excretory organs and the interference with nutrition which pregnancy causes in some cases tend to bring about a condition favorable for the reception and development of infection. In others pregnancy exerts a highly stimulating influence upon nutrition, anæmia gives place to the natural plethora of healthful pregnancy, and such patients are better protected against infection than is the average woman.

The course and severity of an infection in a pregnant patient will depend upon her power of resistance, and especially upon the vigor and completeness of her processes of nutrition and excretion.

The Interruption of Pregnancy by Infection.—The duration or interruption of pregnancy during acute infection seems to depend very largely upon the degree of disturbance of the nervous system which the infection causes. This is especially shown in the disturbance of the heart centres. Some pregnant patients yield but little to an infection, remaining comparatively undisturbed, while in others all of the phenomena of life are greatly altered.

The interruption of pregnancy greatly increases the danger of the infected mother. In cases occurring before full term, dilatation is often prolonged and laceration may occur, followed by the absorption of infectious material. Because of the altered condition of the blood common to infection, hemorrhage is not unusual, with its added risks to the mother. The death of the fœtus adds to the absorption of toxines, and thus increases the mother's burden. When pregnancy is not interrupted, the fœtus shows the acute infections of the mother, resists them with her, and recovers with her. It is more than probable that the recovery of the fœtus is a source of added strength to the mother in these cases.

The Treatment of the Acute Infections in Pregnancy.—The treatment of these conditions in the pregnant woman should be conducted as if the patient were not pregnant. The same agents for controlling temperature, sustaining strength, and quieting the nervous system may be appropriately employed which are successful in the non-pregnant. As the essential phenomena of infection are controlled, the danger of the interruption of pregnancy is diminished, and hence the result for the mother is better. So far as fœtal life is concerned, it is best protected by the appropriate treatment of the mother's condition.

Experience has shown that in the majority of the acute infections the artificial interruption of pregnancy is not indicated. Such interference considerably disturbs the mother; she is not in a condition to submit to anæsthesia if it can be avoided, and no method of artificial dilatation of the birth-canal is free from increased danger of laceration. If the fœtus dies, Nature will expel it with less traumatism and less danger to the mother than is possible by artificial means.

An exception must be made in cases of acute tubercular infection, in which the interruption of pregnancy is distinctly indicated. Here the burden of pregnancy seems to draw so heavily upon the mother's nutrition as to make it impossible for her to combat the infection. After pregnancy has terminated, she is much better prepared to continue the struggle for her own existence.

INFECTIONS OF THE GENITAL TRACT.

Gonorrhœa.—The plethoric condition of the genital organs during pregnancy invites local infection. Of this, gonorrhœa is not uncommon, and produces the same phenomena which are seen in the non-pregnant patient. Difficult and painful micturition, an irritating, purulent discharge, local hyperemia, and the presence of the gonococcus complete the diagnosis. Gonococci not only infect the vagina, but the adjacent tissue, also not infrequently causing abscess of the vulvo-vaginal glands, and sometimes an acute inflammation of the tissues about the rectum. These germs may reach the interior of the uterus and infect the fœtus, and in these cases gonorrhœal conjunctivitis has been seen in the newborn at birth in cases where an antepartum source of infection must have existed. Salpingitis, pyosalpinx, and even ovarian abscess not infrequently follow the infection of the endometrium. Foci of infection may remain undiscovered for an indefinite time after labor. Exertion on the part of the patient or traumatism may produce a rupture of the tissues surrounding such a focus, with liberation of its infectious contents. This material is often exceedingly virulent in character, and may set up a rapidly spreading and general infection. In other cases the urinary organs become infected, and even one or both kidneys may share in the process.

Gonorrhœal cases differ widely in their virulence in pregnant and puerperal patients. In some instances, where the infection does not penetrate the uterus, little, if any, fever may result, and the process seems mild and unimportant. Thrombosis of the veins of the lower extremities sometimes results as a complication, and extensive infection of the wall of the uterus in severe cases may also be present.

Treatment.—The treatment of gonorrhœa complicating pregnancy consists in the thorough disinfection of the genital tract. The external genital organs should be first cleansed with green soap and water, then with boiled water, and then with bichloride of mercury solution, 1-2,000. The tissues about the urethra should be carefully inspected, and should there be a secretion from the urethra, its duct should be thoroughly disinfected. The vagina and cervix may be exposed by retractors or a speculum, thoroughly cleansed with green soap and water, followed by copious irrigation with sterile water, and then by the application of bichloride solution, 1-2,000. This may be done by prolonged douching, or, better, by the use of cotton dipped in the solution, applied under direct inspection. If the cervix is patulous, its canal should be treated in a similar manner. Ulcers upon the cervix or vagina should be cauterized with carbolic acid and iodine, and powdered with iodoform or boracic acid. Such applications may be made daily during the active stage of the infection, and, in addition, the patient should use at least once daily very thorough douching with tincture of green soap and creolin or lysol, each 1 per cent. The diet should be largely of milk, the bowels should be freely opened, an abundance of dilute saline water should be taken, and the quantity of urine increased as much as possible. If there is fever, it is absolutely necessary that the patient should remain in bed. If she is without fever and motion causes no pain, she may be about her rooms. The urine should be examined daily to determine the presence or absence of infection in the bladder.

Should prompt improvement not follow this treatment, dilute tincture of iodine may be applied to the cervix and vaginal mucous membrane, followed by douching with 2 per cent. creolin or lysol. If no improvement follows this, nitrate of silver in solution may be applied, followed by normal salt solution. If the vaginal walls irritate by rubbing, the vagina should be tamponed lightly with iodoform gauze.

The Treatment of the Secondary or Chronic Phases of Gonorrhœa in Pregnancy.—In favorable cases the acute stage of gonorrhœa soon passes, and the patient seems as well as before the attack. Vaginal examinations should be made with sufficient frequency to enable the physician to determine the presence or absence of acute infection of the Fallopian tubes and surrounding tissues. Should this happen, the patient should be kept in bed, milk and light diet continued, and if there is fever and tenderness over the abdomen an ice bag should be placed above the pubes. The bowels should be freely opened by salines. Mild counter-irritation with turpentine stupes may be used in connection with the application of cold. Should pain be sufficient to threaten the production of abortion or premature labor, opium should be given sufficient to control it. Should the patient be much depressed, moderate stimulation with alcohol is indicated. In many cases an infection of the Fallopian tubes gradually subsides under this treatment. Should pyosalpinx occur, infected tissue may be removed by abdominal section.

In the presence of gonorrhœal endometritis or gonorrhœal infection of the decidua, no treatment is directly available. If the process is severe, sufficient irritation is usually produced to excite labor, but in mild cases the uterus does not empty itself, and the condition may first be known after the delivery of the child.

When foci of infection are ruptured during or after the puerperal period, and symptoms of infection of the peritoneal sac develop, immediate abdominal section is necessary. The operator's course after the abdomen is opened must be determined by the conditions found.

Gonorrhœal infection of the urinary tract should receive the same treatment in the pregnant which is successful in non-pregnant patients. Every precaution should be taken to avoid unnecessary disturbance and irritation of the bladder, for the occurrence of premature labor in these cases is a misfortune to be avoided. An infected kidney calls for surgical treatment appropriate to the condition.

VAGINAL DISINFECTION IN CHRONIC CASES.—In cases where an infective discharge persists after the acute stage has passed, the patient may conduct much of her own treatment. Thorough but gentle irrigation of the vagina is necessary in these cases, and, in our experience, the best results are obtained by a combination of tincture of green soap and lysol or creolin, each 1 drachm to the pint or quart of warm water. Many patients complain of considerable irritation when this quantity is added to one pint of water.

The Influence of Gonorrhœa upon the Puerperal Period.—A pregnant patient who has had gonorrhœa comes to labor in an infected condition unless she has entirely recovered from the invasion of the gonococcus. Mixed infection very commonly results, during or after labor, with resulting morbidity or mortality during the puerperal state. The danger to the child is considerable from conjunctival or other infection. Hence, the physician's plain duty is to recognize and promptly treat gonorrhœal infection in the pregnant patient, and as thoroughly as possible. The most obstinate cases sometimes result in a perfect cure. In the experience of the writer, a young pregnant woman suffered from double ophthalmia, the result of gonorrhœal infection. During the greater part of pregnancy a profuse discharge of pus occurred from the vagina, containing abundant gonococci and other allied germs. By thorough treatment with different antiseptics during pregnancy, the virulence of the disease was so much lessened that the patient passed through labor and the puerperal period without renewed infection and without infecting her child. She also escaped pyosalpinx and other secondary manifestations of gonorrhœa.

In the puerperal period gonorrhœal infection of the joints must not be mistaken for so-called rheumatism. The occurrence of a suspicious purulent discharge from the vagina during pregnancy and pain and swelling in the joints during the puerperal period point strongly to gonorrhœal infection.

Syphilis.—Syphilis, when acquired during gestation, is often especially severe. The virulence of the infection depends not only upon the germs of syphilis, but also upon septic bacteria which frequently accompany the other. When infection occurs at conception, if septic germs are present, the complication is most malignant, the disease assuming phases which may greatly perplex the physician. It is estimated that 5 per cent. of pregnant patients are syphilitic in the larger cities.

Course.—Fournier states that a syphilitic woman who becomes pregnant is much more likely to abort than is a pregnant woman who becomes syphilitic. The mortality with the fœtus is greater also with syphilitic women who conceive than with those who had no syphilis before conception. The older the syphilis, provided it has not been treated, the worse the prognosis. The earlier the infection occurs the worse the prognosis for the continuance of pregnancy. If infection is acquired during the first four months of pregnancy, the fœtus commonly dies. Fifty per cent. are lost from the fourth to the sixth month. The general fœtal mortality from maternal syphilis is 75 per cent. The mother's health is often greatly impaired by specific infection. The disease runs in many cases a most acute course.

Constitutional Treatment.—Proper treatment should begin as soon as possible, and be vigorously pursued. The biniodide and bichloride of mercury, calomel, gray powder, and the bichloride given by injections are all of use.

Hare advises the use of a quarter of a grain of the protiodide of mercury, in pill-form, three times daily, increasing the quantity by one pill every second day. When diarrhœa, fetid breath, or a slight tenderness of the gums occur, the dose may be reduced one-half, and if this agrees with the patient it may be continued for, if necessary, a year or more. If local symptoms of syphilis arise, the amount must be increased. Where pain and purging follow, opium must be combined with mercury. Mucous patches are best treated by applications of solid nitrate of silver or sulphate of copper, 20 per cent. chromic acid solution, or the acid nitrate of mercury. Mucous patches in the vagina or vulva are well treated by douches of bichloride solution, 1 : 2,000, followed by dusting with calomel and bismuth. Where headache is obstinate, one-sixth of a grain of calomel may be given every two hours. Where it is desirable to combine iodide of potassium with mercury, the following will be found useful:

Potassium iodide	ʒ 2.
Bichloride of mercury	gr. ½.
Syrup of orange-peel	℥ 1.
Water to make ℥2.	

A teaspoonful three times daily.

Potassium iodide may be given in milk, with little disturbance to the patient. It is also useful in the following formula:

Iodine	grs. 4.
Iodide of potassium	ʒ 4.
Compound syrup of sarsaparilla	℥ 4.

A teaspoonful three times daily after meals.

In dealing with syphilis in pregnancy mercury is usually more valuable than are the iodides. To combat the anæmia which is present, iron or arsenic should be given freely. The following in pill-form may be found useful:

Blue mass	grs. 30.
Powdered chloride of iron	grs. 15.

In 12 pills: 1 three times daily.

In using inunctions of mercury, a warm bath should be first taken and an area selected least likely to be irritated by the pressure of neighboring portions of the body or the friction of the clothing. The oleate of mercury or mercurial ointment may be selected. One drachm of mercurial ointment may be rubbed in daily, the surface of the skin being protected by soft flannel at the site of the inunction. In using the bichloride hypodermatically, the aggregate dose given is from one-sixth to one-third of a grain, administered daily under antiseptic precautions.

Good results have also been obtained by combining bichloride of mercury with extract of opium and extract of gentian, in pills.

Local Treatment.—The local treatment of syphilitic lesions calls for the thorough use of antiseptics. The parts must be kept clean with douches and dusted with calomel and iodoform, while the discharges should be received upon an absorbent material, which must be burned.

Remarkable success is claimed by Riehl[171] in the local treatment of syphilis with vaginal capsules. These capsules contained 15 grs. of mercurial ointment with cocoa butter. They were inserted and carried into the cervix if possible, or against the cervix, and were retained in place by a tampon of aseptic cotton or gauze. Thirty-three patients were so treated, with the result that labor occurred at full term in 88 per cent., with 88 per cent. of apparently healthy children. Abortion occurred in 3 per cent., and premature labor in 9 per cent. Six per cent. of the children were stillborn, and 6 per cent. were syphilitic. The entire fœtal mortality in this series of cases was 12 per cent., and the morbidity 21 per cent.

General Treatment.—The general treatment of syphilitic patients is also important. The anæmia from which they suffer requires the use of iron, arsenic, and often cod-liver oil. Distinct improvement is obtained by stimulants and tonics, while abundant food should be taken.

In cases promptly treated very satisfactory results are obtained,

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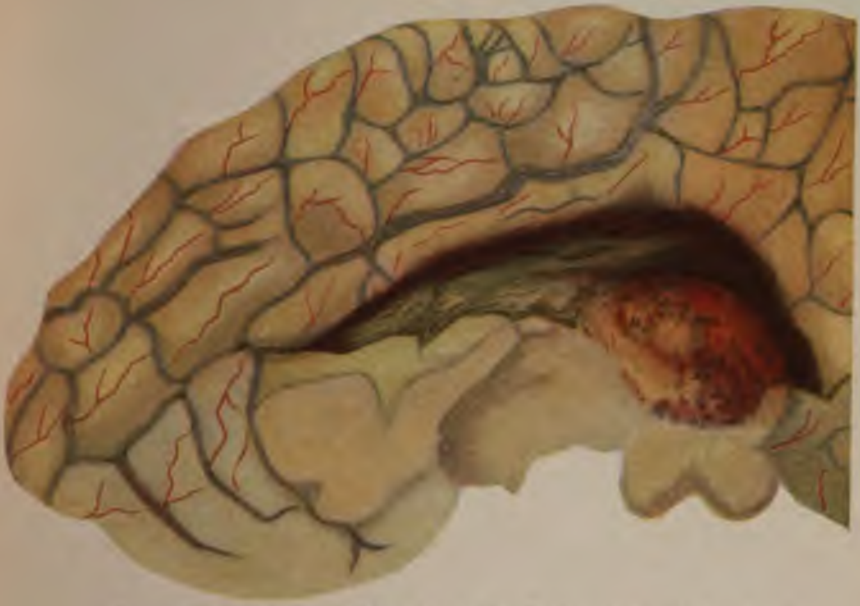
[171] Riehl: Wiener klinische Wochenschrift, 1901, No. 26.

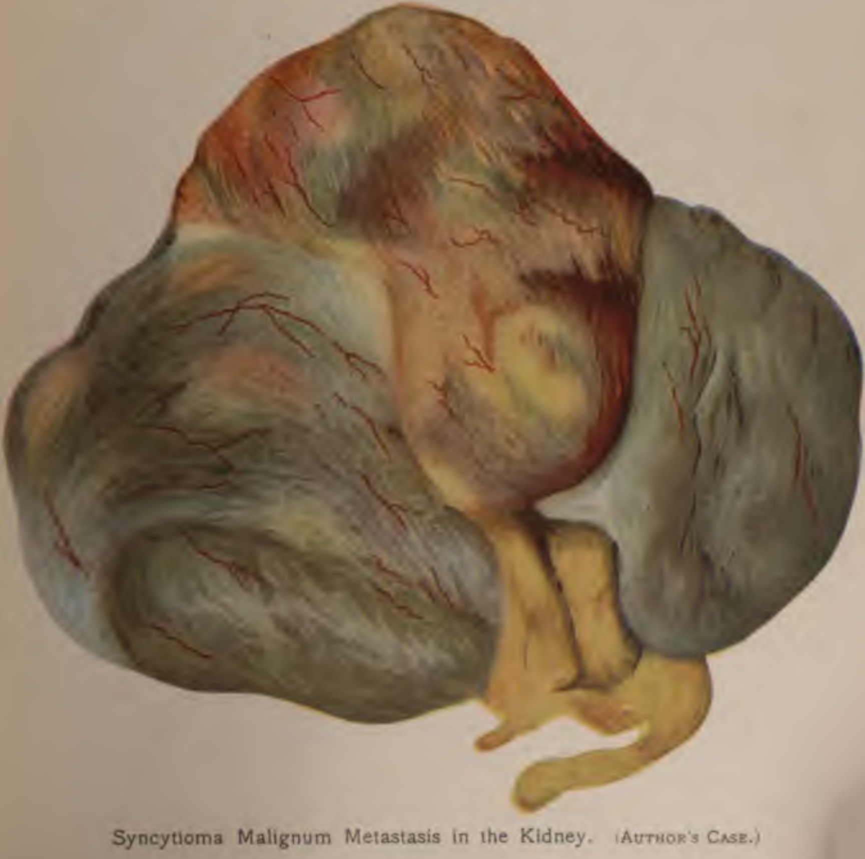
PLATE XIII.

Fig. 1.



Syncytioma Malignum Metastasis in the Brain. (Author's Case.)

Fig. 2



Syncytioma Malignum Metastasis in the Kidney. (Author's Case.)

obscured by symptoms produced by metastases, which do not point to uterine lesions. The following case in the experience of the writer illustrates the salient features of syncytioma malignum:

The patient was a multipara of middle age, who had borne a number of children in spontaneous parturition. She was advanced a few months in pregnancy, and suffered greatly from pernicious nausea. Other treatment failing, the uterus was emptied under anæsthesia. The womb was found considerably enlarged from previous subinvolution, but no lesion was present. Following this the nausea ceased, but the patient developed intense headache and rapidly failed and died. Upon autopsy, syncytioma malignum was found in the brain, lungs, spleen, liver, and kidneys of the patient. No trace of its presence was discovered in the uterus.

Treatment.—In the present state of our knowledge we can do nothing to prevent this condition except to secure the thorough evacuation of the uterus in cases of abortion and after labor at full term; hence, especial care should be used to secure the complete expulsion of the placenta, and also of the embryonal and maternal tissues after abortion. Unless the physician is satisfied by thorough examination that an abortion is complete, thorough curetting should be promptly done.

As in most cases the uterus is involved, so soon as a diagnosis is made the uterus should be removed. Whether this is done by abdominal or vaginal section will depend upon the general condition of the case and the operator's preference.

At the present time the prognosis for the mother's life and for the continuance of pregnancy is hopeless. No patient in whom a diagnosis has been positively made has recovered from this disorder.

Enteric or Typhoid Infection.—Pregnancy is no bar against the occurrence of enteric or typhoid infection. The disorder develops in its characteristic manner, and if the infection is a mild one the pregnancy may not be interrupted, and the patient's recovery may not be essentially jeopardized by this complication. The fœtus often shares the mother's infection, and the bacillus coli communis and the typhoid bacillus may make their way into the peritoneal tissues of the mother and cause mixed and septic infection.

Enteric infection during the latter part of pregnancy frequently remains entirely latent, and appears only after labor. In these cases, beyond slight malaise, the patient has no symptom of typhoid. She may pass through labor without complications. Within a few days after labor the characteristic fever and other symptoms may develop. In these cases it is difficult to calculate the beginning of the infection.

Very high temperature in the pregnant woman during typhoid predisposes to hemorrhage on the part of the mother and to the death of the fœtus. The interruption of pregnancy is unfavorable for the mother, for hemorrhage and septic infection may complicate her recovery. If the mother's temperature be very high and this be prolonged, the nervous system of the child may suffer.

Prevention.—Pregnant patients should not care for typhoid patients, nor should they use the same bed, bedding, or clothing which a typhoid patient has used. Mixed infection may result if these precautions are not taken. The pregnant patient should have a pure and good water supply, and should avoid contact in any way with those suffering from enteric infection.

Treatment.—In the interests of mother and child, pregnancy should not be interrupted during enteric infection. The mother's temperature should be controlled by local applications. In cases not yielding to sponging or packing, the bath may be employed. In the event of abortion or premature labor, every precaution must be taken to avoid excessive hemorrhage: otherwise the efficient treatment of enteric infection in the pregnant patient does not differ essentially from that of the non-pregnant, nor are the results especially worse.

Erysipelas.—Among the most dangerous of the infections complicating pregnancy is erysipelas. Its least dangerous form is facial, in which it may even produce abortion through the occurrence of general puerperal septic infection. Should erysipelas attack the lower extremities, the hands and arms, or the lower portion of the trunk of the body, puerperal septic infection is practically inevitable. In its symptomatology erysipelas does not differ in the pregnant and parturient patient from cases in the non-pregnant. Care must be taken to avoid confounding it with puerperal septic infection or with diphtheria of the vagina or vulva. The exact diagnosis may be made by bacteriological examination.

Treatment.—The most thorough and persistent local antiseptic treatment is necessary in these cases. The use of rubber gloves on the part of physician and nurse, the application of antiseptic dressings in the form of antiseptic collodium or ointment or gauze dressings should be practised. The great danger to the mother arises from examinations or manipulations about the genital tract, hence such should be reduced to the smallest number possible, and should be preceded by very thorough cleansing and antiseptic applications to the tissues about the birth-canal. In the event of labor during erysipelas, the greatest care is necessary to prevent infection.

Fœtal Infection.—Erysipelas of the face and head in the mother has been found in the fœtus at birth. A red edematous swelling upon parts corresponding to those affected in the mother is observed in these cases on which desquamation develops. General septic infection occurs in the fœtus in most of these cases.

Diphtheria.—Diphtheritic infection in the pregnant or parturient woman may attack the genital tract, or the usual manifestations of the disease may be observed in the fauces. In either case, a positive diagnosis is made by bacteriological examination.

Treatment.—Diphtheria of the throat or of the genital tract requires the same methods of treatment, namely, the free use of antitoxin. Locally, mild antiseptic solutions or powders are needed. In the writer's experience, it is possible for a patient to have well-marked diphtheria of the vagina and vulva, and to recover under such treatment without general septic infection. Abortion occurred, but it was impossible to tell whether the diphtheritic infection had arisen during the abortion or whether the abortion was caused by the diphtheritic infection.

Measles.—Although we are accustomed to think of measles as a comparatively mild disorder, in the pregnant and parturient patient it may become as severe as erysipelas. Its symptoms are those usually observed in adults, although in many cases the eruption takes anomalous forms. If the accompanying bronchitis is widespread and severe, abortion may result from the incessant cough. There is a decided danger of catarrhal pneumonia, the mother's labored respiration predisposing to the accumulation of catarrhal products in the lungs.

Treatment.—The treatment of measles complicating pregnancy and parturition consists in the observance of strict antiseptic precautions in labor and the puerperal period, and in attention to the condition of the bronchial tubes.

Fœtal Infection.—Measles may be transmitted from mother to child, the characteristic eruption developing a few days after birth. In severe measles hemorrhage has been observed upon the maternal aspect of the placenta.

Scarlatina.—The close resemblance of scarlatina to streptococcus infection makes it a dangerous complication of pregnancy and parturition. Mixed infection frequently accompanies scarlatina, and fœtal infection is not unusual. It is exceedingly difficult to trace the medium of contagion in these cases. From three to five days is the usual incubation period. In about one-third of the cases the disease is mild, while septic infection develops in nearly half. In these cases the interruption of the pregnancy will depend upon the severity of the infection and the patient's temperature.

Treatment.—The treatment of scarlatina complicating pregnancy and the puerperal state consists in the observance of careful antisepsis about the genital tract and in the avoidance of examinations or manipulations so far as possible. Recognizing the fact that scarlatina is conveyed by direct contact, the infection should be limited to one patient as a rule. Should wounds and lacerations occur during labor, septic infection is almost invariable. In the treatment of this condition the liability of nephritis must be remembered.

Variola.—With repeated vaccination, variola may be excluded from the diseases of pregnancy. The pregnant condition is no contraindication for vaccination, but vaccination should be done under antiseptic precautions invariably. Vaccination may or may not protect the fœtus, and no positive prognostication can be made. Pregnant women who have been successfully vaccinated, should they become infected by variola, have the disease in a mild and modified form. The prognosis for mother and child in pregnancy complicated by variola must depend upon the presence or absence of previous vaccination, the severity of the infection, its temperature range, and the presence or absence of the interruption of pregnancy. The interruption of pregnancy always adds to the gravity of the situation.

Treatment.—Every precaution should be taken to secure competent vaccination under antiseptic precautions for pregnant patients. In the event of an epidemic of smallpox, all pregnant patients should be vaccinated, provided it can be done competently with antiseptic precautions. Should infection occur, the treatment which is best adapted for the condition in the non-pregnant should be employed. As in other infections, the effort should be made to prevent the interruption of pregnancy, examinations and manipulations should be reduced to a minimum, and strict antisepsis faithfully practised.

Pneumonia.—The various forms of pneumonia may complicate the pregnant condition. The fact that the uterus and its contents interfere with respiration, the additional burden upon the patient's excretion which the fœtus occasions, and the susceptible condition of the nervous system render the pregnant patient an unfavorable subject to combat pneumonia. Abortion is frequent, occurring in about one-half of reported cases. The symptomatology is that of the non-pregnant, and great engorgement of the thoracic circulation may be a prominent feature. In some cases bleeding has become necessary during labor to relieve cyanosis and threatened asphyxia. The occurrence of labor temporarily relieves dyspnœa, but the mother is worse soon after.

Treatment.—The milder infections, which sometimes lead to catarrhal pneumonia, should be carefully avoided in the pregnant woman. Should they occur, they should receive thorough treatment. Cupping is of benefit in many cases, and strychnia and atropia by hypodermatic administration are often of great value. In proportion to the extent of lung tissue involved and to the degree of fever present, the condition becomes serious. Pregnancy is most often interrupted in the later months. The maternal mortality is reported as varying from 50 to 100 per cent., with a fœtal mortality of 80 per cent.

The treatment of pneumonia complicating pregnancy must be conducted upon lines already indicated. The free administration of oxygen in the form of fresh air or by inhalation of the gas is important. Fever must be regulated by the application of cold, and counter-irritation is often valuable. Should a patient with pneumonia come into labor and be cyanosed, with great depression of the circulation, bleeding from the uterus in moderation should be encouraged. A positive diagnosis of the variety of pneumonia present may be made by bacteriological examination, and cases of acute miliary tuberculosis should receive appropriate and discriminating treatment.

Fœtal Infection.—The fœtus often shares the mother's infection, and in the writer's experience a young primipara perished from catarrhal pneumonia, her child developing the disease at birth, and, after a serious illness, recovered.

ment without general septic infection. Abortion occurred, but it was impossible to tell whether the diphtheritic infection had arisen during the abortion or whether the abortion was caused by the diphtheritic infection.

Measles.—Although we are accustomed to think of measles as a comparatively mild disorder, in the pregnant and parturient patient it may become as severe as erysipelas. Its symptoms are those usually observed in adults, although in many cases the eruption takes anomalous forms. If the accompanying bronchitis is widespread and severe, abortion may result from the incessant cough. There is a decided danger of catarrhal pneumonia, the mother's labored respiration predisposing to the accumulation of catarrhal products in the lungs.

Treatment.—The treatment of measles complicating pregnancy and parturition consists in the observance of strict antiseptic precautions in labor and the puerperal period, and in attention to the condition of the bronchial tubes.

Fœtal Infection.—Measles may be transmitted from mother to child, the characteristic eruption developing a few days after birth. In severe measles hemorrhage has been observed upon the maternal aspect of the placenta.

Scarlatina.—The close resemblance of scarlatina to streptococcus infection makes it a dangerous complication of pregnancy and parturition. Mixed infection frequently accompanies scarlatina, and fœtal infection is not unusual. It is exceedingly difficult to trace the medium of contagion in these cases. From three to five days is the usual incubation period. In about one-third of the cases the disease is mild, while septic infection develops in nearly half. In these cases the interruption of the pregnancy will depend upon the severity of the infection and the patient's temperature.

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Cholera.—Cholera may attack the pregnant patient in its characteristic manner. The disease is recognized by copious discharges from the bowels and stomach in the early stages, and later by intoxication or general asphyxia. Very frequently the disease will give its first manifestations during the night or early in the morning. If the patient rallies from collapse, she may pass into a typhoid condition and delirium, with coma. During the latter the pulse is heavy and full, but the patient breathes irregularly and conjunctival hemorrhage is frequently present.

Pregnant patients attacked by cholera complain of a remarkably strong and vigorous fœtal movement. During the stage of intoxication the fœtus usually perishes. Examination of the placenta shows its epithelium extensively diseased, with hemorrhages and early separation. The interruption of pregnancy usually occurs at the beginning of the typhoid stage. Very frequently artificial delivery is necessary, but postpartum hemorrhage is infrequent, and, if the mother recovers from cholera, involution usually proceeds in a normal manner.

The prognosis for the fœtus in these cases is exceedingly grave. For the mother, pregnancy does not seem to increase the gravity of the situation.

Treatment.—The treatment of pregnant patients suffering from cholera is practically that of the non-pregnant with the same disorder. Labor should be speedily terminated after it has begun, and care should be taken to secure good uterine contractions and to avoid hemorrhage.

Malaria.—Pregnancy secures no exemption from malarial infection. In the same way, and with the same symptoms observed in the non-pregnant, malaria may attack mother and fœtus. Fœtal chills are manifested by increased motion, often producing considerable suffering to the mother. A positive diagnosis by the examination of the blood enables the physician to distinguish between septic infection and that from malaria. Severe malarial intoxication predisposes to changes in the mother's blood, to active and passive hemorrhage, and may bring about a fatal issue. In the writer's experience, a patient died, after an easy labor, of obscure symptoms, pointing to severe infection. Autopsy and examination of the blood showed that a severe and old malarial intoxication was the cause of death.

Treatment.—The treatment of malaria complicating pregnancy consists in the free use of quinine, accompanied or preceded by purgation and by the administration of arsenic, iron, and other tonics. The tendency to hemorrhage should be remembered in the event of labor, and every precaution taken to avoid this complication. It is of the utmost importance that a prompt diagnosis of malaria be made. In the puerperal state the occurrence of chill and fever should be ascribed to septic infection, and treatment instituted accordingly, unless the examination of the blood gives a positive diagnosis of the esence of malaria.

Tetanus.—One of the most fatal infections attacking the pregnant woman is that of tetanus. During the first three months the pregnant woman is especially susceptible to the tetanus bacillus. The greater part of these cases occur during the first half of pregnancy. The infection takes place very rarely during or after parturition at full term. Cases of abortion requiring instrumental interference, especially cases of criminal abortion, are very liable to develop this infection. In the tropics, where climatic conditions are favorable for the development of bacteria, tetanus is most frequent. Most of these cases occur in multiparæ older than the average whose dwellings have been damp and dirty.

The usual symptoms are observed in these cases. Positive diagnosis is made by bacteriological examination, and much valuable information is obtained by bacteriological examination of the water used in caring for parturient patients. Tetanus has followed the administration of intrauterine douches with water which had not been boiled, and which contained the infecting germ.

Treatment.—The treatment of tetanus complicating pregnancy is practically entirely prophylactic. The well-developed tetanus infection in the pregnant or parturient woman has rarely yielded to treatment. In the presence of the disease, the use of appropriate serum is indicated.

Tetany.—This milder infection is not uncommon among parturient women. It usually occurs in ill-nourished primiparæ or in multiparæ above the average age. It is more frequent among women who nurse their children than among those who do not. Spasm of the muscles of the hand usually marks the beginning of the disorder. With varying degrees of severity, this spasmodic condition extends throughout the muscular system. When unaltered by interference, the spasms are symmetrical. The patient remains conscious, the attacks are brief, and are not continuous. A feeling of numbness is often described as preceding a seizure. Pressure upon the principal bloodvessel or nerve of a limb in which tetany has been observed will produce the characteristic feeling followed by a seizure. Cold diminishes the spasms. The disease shows a predisposition to attack flexor muscles. An examination by electricity demonstrates that the reflexes are greatly augmented. There is very seldom fever, but any irritation of the nervous system may produce a spasm.

To distinguish between tetanus and tetany, it must be observed that in tetanus the muscles of the face and throat are first attacked and opisthotonus is present. In tetany the abnormal condition of the muscles is first seen in the extremities, causing a characteristic posture. There is constant spasm in tetanus, but intermittent in tetany. Tetany is comparatively harmless, while tetanus is very fatal.

Treatment.—Tetany in pregnancy usually yields to appropriate treatment. The patient's general nutrition should be carefully maintained, abundant rest must be secured, and entire cessation from a trying and burdensome occupation. The muscles affected should, if possible, be put at rest. The administration of sedatives to the nervous system is indicated, but of equal or greater importance is attention to the patient's general hygiene.

CHAPTER XIX.

TRAUMATISM AND SURGICAL OPERATIONS DURING PREGNANCY.

THE healthy pregnant patient may display extraordinary tolerance of severe traumatism or surgical operations of considerable severity. In other cases very slight disturbance and unimportant manipulations terminate gestation. The difference in result seems to depend not so much upon the severity of trauma or operative interference as upon the healthful or susceptible condition of the patient's nervous system and endometrium. The premature termination of pregnancy following accident or surgical operation is unfavorable, for the patient has the added disturbance of parturition, with greatly increased liability to septic infection.

In estimating the danger to pregnancy following a given operation, it must be remembered that operations upon the generative organs need not interrupt pregnancy, while, on the contrary, operations upon the rectum are not infrequently followed by the termination of gestation.

Operations upon the Uterus during Pregnancy. Myomectomy.—Recent study of the influence which myomata of the uterus exert upon pregnancy and parturition shows that in many cases it is safer for the patient to remove a fibroid during gestation than to allow the patient to go on uninterruptedly to full term. The situation of the tumor has much to do with the decision to operate. Cases most favorable for operation are subperitoneal in location. Experience has shown that such tumors of considerable size may be safely removed without sacrificing the uterus and without interrupting the pregnancy. The removal of such a tumor becomes a necessity when the tumor is so attached to the uterus that it must inevitably prevent the descent of the child into the pelvis. If the tumor is in the upper portion of the womb and subperitoneal, the obstetrician may elect to allow the pregnancy to go on, standing ready to interfere should complications arise from the presence of the tumor during labor or the puerperal state.

When submucous or interstitial fibroids are of such size as to make labor at full term impossible and the continuance of pregnancy dangerous, hysterectomy is indicated.

In dealing with fibromata complicating pregnancy, it should be remembered that surgical operation in good hands is far less dangerous than the production of abortion or premature labor. In the latter the danger of septic infection is considerable.

Method of Operation.—The removal of myomatous tumors from the pregnant womb is accomplished by incising the capsule of the tumor, removing it with a blunt dissector and closing the cavity left by several layers of deeply-buried catgut stitches. A continuous suture of fine catgut or fine silk should close the line of incision in the capsule. After operation the patient should be given sufficient opium to prevent uterine contractions.

The Operative Treatment of Cancer of the Womb Complicating Pregnancy.—Epithelioma of the cervix requires the prompt removal of the cervix and the application of the cautery to remaining tissue in which infection is feared. When carcinoma is present, if the uterus be small, total extirpation is demanded. Should the patient choose to go to viability, with the hope of securing a living child, Cæsarean section is indicated, followed by the removal of the entire uterus. In syncytioma malignum diagnosticated during pregnancy, the immediate removal of the entire uterus is the only method of treatment which should be considered.

Operations upon the Cervix during Pregnancy.—In cases where the cervix is greatly enlarged, the cervical glands degenerating rapidly, and a chronic infection present, pregnancy does not contraindicate amputation of the cervix or trachelorrhaphy. Under antiseptic precautions, and with the use of opium afterward to control uterine contractions, such treatment may be safely carried out, followed by great benefit to the patient. There may be increased tendency to bleeding, but this should be met by rapid suture.

Operations for the Replacement of a Dislocated Pregnant Uterus.—It is rarely necessary to operate for the permanent relief of dislocation of the uterus during pregnancy. Should, however, a condition arise in which this is demanded, ventro-suspension or shortening of the round ligaments may be employed, as the judgment of the operator suggests.

Operations upon the Tubes and Ovaries during Pregnancy: Ovariotomy. — Pregnancy much increases the dangers to which the presence of an ovarian tumor exposes the patient. Twisting of the pedicle, followed by gangrene and septic infection, is much more common in cases of ovarian tumor in pregnant women than in those who are not pregnant. Dermoid tumors are more likely to become infected, and are often found impacted in the pelvis, occasioning a great obstacle to parturition. The risks of ovariotomy are distinctly less than those incurred by omitting this treatment. If possible, operation should be done before the fourth month (Dsirne[169]), for pregnancy is less likely to be interrupted at this time. Double ovariotomy may be successfully performed during pregnancy without interrupting gestation. Under no circumstances should an ovarian tumor complicating pregnancy or labor be tapped. Infection almost invariably follows, and if the patient is to be saved it must be by abdominal section, to which the risks of pre-existing infection are added.

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[169] Dsirne: Archiv für Gynäkologie, Band 43, Heft 3.

Operations upon the Fallopian Tubes.—Pregnancy is no contraindication to incision or removal of one or both of the Fallopian tubes. The same indications which demand operation in the non-pregnant should be accepted. Pyosalpinx may remain undetected, but is very likely to rupture during labor, and infection result. In some cases pyosalpinx is accompanied by adhesions which prevent the development of the uterus and cause abortion. In hematosalpinx the operator will recall the frequent occurrence of tubal gestation, and in some cases remnants of the embryo will establish the diagnosis.

Operations upon the Pelvic Floor and Vagina.—In cases where an old and extensive laceration causes suffering and is associated with an infected condition of the cervix, it may be necessary to operate upon the cervix, pelvic floor, and vagina. While such operations should not be undertaken without positive indication, they may be successfully performed upon a pregnant patient. Hemorrhage should be prevented and promptly controlled by suture, and sufficient opium used after the operation to quiet the patient. Where the perineum has been completely torn and the sphincter has been torn through, additional care must be taken to prevent abortion.

Operations upon the Rectum during Pregnancy.—Operations upon the rectum should, if possible, be avoided during gestation. Should hemorrhoids become extensively distended and infected, the necessity for operation may become imperative, and the risk may be less from operation than from delay.

General Surgery upon Pregnant Patients.—The literature of the subject affords evidence of the successful performance of intestinal resection, suture of the peritoneum following lacerating wound, removal of stone in the bladder, removal of the cancerous breast, operation for parasites of the abdominal cavity, and amputation for crushing injury. Keen[170] amputated successfully at the hip joint for malignant growth of the femur in the case of a woman five months pregnant. On the contrary, cauterization and some of the minor operations, in which pain is not completely prevented, have been followed by abortion.

To prepare a pregnant patient for a surgical procedure, excretion should be stimulated for several days before the operation. While hemorrhage does not seem to produce abortion, it makes the pregnant woman very susceptible to infection, and hence every precaution should be taken to avoid it. Shock must be prevented and pain also. Fractures unite poorly in pregnant women, and the application of counter-irritants and cauteries should not be permitted.

Accidents and Injuries to Pregnant Women.—Pregnant women bear accident and injury remarkably well in some cases, while in others a very slight disturbance is followed by abortion. Where the endometrium has been perfectly healthy and the nervous system of the patient is not excitable, a pregnant woman has survived bruises, scalp wounds, and erysipelas without abortion. Gun-shot wounds through the abdomen which avoid the uterus are not always fatal, nor are they always followed by abortion. Wounds of the lung are recorded in pregnant women without the death of the mother and the interruption of pregnancy. No hesitation should be felt in carrying out any surgical treatment which a given injury demands. The cautions already indicated for surgical operations on the pregnant patient should be observed.

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[170] Keen: Medical News, March 26, 1892.

CHAPTER XX.

ABORTION AND PREMATURE LABOR.

ABORTION.

Phraseology.—By the term abortion is understood the expulsion of the ovum before the period of viability. When the fœtus is born after it becomes viable, but before the normal termination of pregnancy, it is known as premature labor. In the language of patients, abortion is seldom used, on account of its frequent criminal association. Women commonly speak of any premature expulsion of the ovum as a miscarriage or premature labor.

Etiology.—The causes of abortion are those which pertain to the parents or to the ovum itself. The most frequent parental cause for abortion is syphilis. This operates in two ways—first, by producing in the mother a diseased decidua, which is incapable of nourishing the child, and, second, by so affecting the embryo that its development is impossible. As a result of syphilis, the decidual cells become occluded, fatty degeneration ensues, the nutrition of the ovum is impossible, separation and hemorrhage occur, and the ovum dies and is expelled. Constitutional disease in the mother, severely affecting her nutrition, may also result in premature separation of the ovum. In these cases, as in syphilis, the immediate cause is found in an abnormal condition of the bloodvessels of the decidua, resulting in hemorrhage, embryonal death, and expulsion. Chronic metallic poisoning, severe malarial intoxication, vascular changes accompanying nephritis, or the development of malignant disease in the uterus may bring about abortion. Direct violence to the mother by a fall or blow, by excessive coughing or straining, or by some direct disturbance of the uterus, may also cause separation of the ovum and abortion.

On the side of the ovum, pathological conditions interfering with its circulation produce abortion. Degeneration of the villi of the chorion, syphilitic changes, hemorrhages accompanying toxæmia, and mechanical violence, which produces hemorrhage, are among the fœtal causes of abortion.

The Signs of Abortion.—The signs of abortion are contraction of the uterus, generally causing pain, with hemorrhage. Dilatation of the cervix will sooner or later occur, although at first the mouth of the womb may not open until a considerable amount of blood has collected within its cavity. If no interference be practised and uterine contractions continue, the mouth of the womb gradually opens and the embryo and its appendages are expelled. Before the fifth and sixth months the embryo is often expelled entire, while after that time the membranes commonly rupture, and birth occurs very much as at term.

Incomplete Abortion.—By incomplete abortion is understood the retention within the uterus of a portion of the embryo. As this is soon cut off from its blood-supply, it will end in necrosis. This affords a most favorable culture-ground for germs, and, should infection occur, a most serious complication will be added.

Therapeutic Abortion.—By therapeutic abortion is understood the emptying of the uterus before the embryo is viable, to rescue the mother from a diseased condition aggravated by pregnancy.

Course and Results.—Abortion resembles a miniature labor. For the expulsion of the ovum the cervix must soften, the os must dilate, the uterus must expel its contents and then undergo contraction and involution. Apparently this is a simple process, and cases are occasionally seen in which repeated abortion leaves no sign of its occurrence. In most cases, however, the cause which produced abortion produces also a chronic pathological condition in the generative organs. Subinvolution is very common, as after abortion the causes which produce normal involution are lacking. As there is no child to nurse, the uterus is not physiologically stimulated to expel its decidua in a perfect manner; the process is an incomplete and imperfect one. Should infection occur at abortion, a chronic endometritis may result, from which recovery is slow and difficult.

Abortion is often the expression of a depraved condition of the nervous system and of the general nutrition. These patients may have one or two abortions, falling into a condition of chronic neurasthenia and malnutrition, which is often permanent. Operation seems to aggravate the general condition, although no definite local lesion can often be found in these cases.

Abortion exposes the patient to the dangers of hemorrhage and septic infection. Few patients die from bleeding at abortion, but in many cases severe bleeding during abortion so weakens the patient that infection is not resisted, and a fatal issue follows. Bleeding should be avoided in abortion as a serious complication.

The direct mortality from abortion occurs from septic infection or from the development of syncytioma malignum. Septic infection usually arises from some criminal or careless performance by an attendant. It furnishes the most frequent cause of mortality in abortion, and is, fortunately, the most preventable. While deaths from malignant disease following abortion are rare, the number is sufficient to draw our attention to its danger.

Mortality of Abortion.—A numerical estimate of the mortality rate of abortion is impossible. Criminal abortion has a large septic mortality, and these cases are concealed in all possible ways. Septic infection after abortion may develop slowly, and may be mistaken for other conditions. Death returns cannot furnish accurate statistics upon this point.

Morbidity of Abortion. —From the same circumstances which influence the mortality returns of abortion, its rate of morbidity cannot be accurately stated. Chronic lesions following abortion may not immediately become apparent, and may be ascribed by the patient or her physician to other circumstances. In cases where a patient remaining sterile gives a history of abortion followed by symptoms of chronic pelvic distress, and examination discloses pathological conditions in the generative organs pointing to previous infection and subinvolution, it is fair to conclude that the abortion played an important part in producing the condition present.

Prevention.—To prevent abortion, care must be taken that the uterus is in proper position, and that no pre-existing pathological condition is present which prevents the uterus from rising normally in the abdomen and developing in the usual manner. Thus displacement of the womb must be corrected, and a chronic endometritis must be cured. Important variations from normal in the condition of the general nutrition or of the nervous system must, if possible, be remedied. A marked tendency to obesity must be corrected by appropriate treatment, and excessive nervous disturbance must also be prevented. Syphilis or any other infection must receive appropriate treatment. In some cases the administration of thyroid extract may bring about sufficient improvement in the patient's general nutrition to permit the development of the impregnated ovum. If the patient has repeatedly aborted, especial care is necessary at those times when menstruation usually occurs. At these periods the patient must be kept in bed and sedatives to the nervous system or drugs which prevent contractions of the uterus must be administered. The belief is widespread among practitioners that viburnum prunifolium has an influence in preventing uterine contractions. This remedy has the advantage that it seldom disturbs the patient's digestion, and that it may be continued for some time without injury. In patients who are desirous of offspring, it has unquestionably a calming influence upon the mind to take any simple remedy at regular times. Obstinate constipation and diarrhœa must alike be prevented, as each increases the irritability of the uterus.

Can Abortion be Arrested?—In some cases threatened abortion can be averted. If the patient is of sound constitution, has not previously aborted, and has a healthy uterus, the ovum may become partially separated through excessive exertion or some slight violence. If the case be seen promptly before hemorrhage has been considerable, and before the cervix is thoroughly softened and the os partly dilated, the abortion may in some cases be prevented. If, however, the patient is highly excitable, and has had chronic endometritis, and hemorrhage has been severe, and the cervix is softened, and the os partly dilated, abortion is probably inevitable.

Treatment of Threatened Abortion.—Immediate and absolute rest must be secured. The patient must be put in charge of a nurse or suitable attendant, must be placed in bed, and must not leave her bed nor abandon the recumbent position. The patient must use a bed-pan. All causes of mental and nervous disturbance must promptly be removed. The patient must be protected from excessive heat or excessive cold. Her food must be of the simplest and most digestible variety. No stimulants should be taken.

Those drugs may be used which prevent uterine contraction and calm the nervous system. Opium by rectal suppositories, containing 1 gr. each of the aqueous extract, is most efficient. The bromides and viburnum prunifolium may also be given. If constipation exists, the gentlest laxatives may be used, and a movement of the bowels may be deferred if possible until hemorrhage has diminished. The patient should be kept as aseptic as possible. The external genital organs should be thoroughly cleansed with soap and water, and made aseptic with a solution of bichloride of mercury. The patient should wear a sterile gauze dressing, with T bandage, and the dressing should be retained for inspection by the physician. The use of the catheter should be avoided if possible, but distention of the bladder cannot be permitted, as this will increase the irritability of the womb. All antiseptic precautions must be taken should the use of the catheter be inevitable. If hemorrhage be considerable and the patient be robust, an ice bag may be placed upon the abdomen above the pubes.

It is important that the patient be controlled by a firm but hopeful and gentle influence. She should be told that abortion is not inevitable, and that if she will be quiet and patient there is a good chance of continuing the pregnancy. She requires close observation to determine whether blood loss is sufficient to weaken the patient and whether the abortion is inevitable.

Treatment of Inevitable Abortion.—When pain and hemorrhage increase, abortion is inevitable. If hemorrhage is not severe and the patient is strong, active interference is unnecessary. Abortion will proceed very much in the same manner that labor occurs, and during an especially strong pain, or while the patient is straining to empty the bowel, the ovum may be expelled, often surrounded by clotted blood. Pain and hemorrhage greatly diminish after the expulsion of the ovum. Inevitable abortion must be conducted by strict antiseptic precautions. The hands and instruments of the physician, the hands of the nurse, and the dressings employed must be thoroughly antiseptic. As the case progresses, the physician must carefully examine all clots and all dressings. Clots may be placed in a white basin containing cold water and thoroughly broken up, so that any portion of the embryo shall not escape detection. In very early abortion the embryo may be expelled with its sac unopened, and with a large part of the chorion present. The maternal decidua in these cases is retained. In later abortion the fœtus may be expelled followed or accompanied by the placenta, the maternal decidua remaining. In these cases, where hemorrhage is moderate and the patient's strength is good, *and when the physician is sure by personal observation that the ovum and appendages have all been expelled,* active interference is unnecessary. The vagina may be thoroughly cleansed with an antiseptic solution after the expulsion of the ovum, antiseptic dressings applied, and, if hemorrhage recurs actively, strychnia and ergot may be given.

Delay in Abortion.—When hemorrhage continues to such an extent that the death of the ovum is undoubted, while the ovum is not expelled, the hemorrhage must be controlled in the interests of the mother. While it is possible to anæsthetize the patient, dilate the womb, and curette away the ovum, still it is not always necessary to complete abortion in that manner. The mother is threatened during abortion with two dangers—one is hemorrhage and the other is septic infection. Any form of treatment which successfully secures the entire expulsion of the ovum must also guard against these dangers. This can be accomplished by the proper use of the antiseptic tampon.

To apply this form of treatment, the vagina should be thoroughly douched with bichloride of mercury solution, 1 : 4,000. The patient should be placed upon her back or side, and the perineum and pelvic floor pressed downward and backward by a speculum or by the fingers of the operator. A strip of antiseptic gauze four inches wide and a yard long should be thoroughly packed about the cervix with uterine dressing forceps, the end of the gauze being carried through the cervical canal by the finger if possible. The presence of this tampon serves to bring about the desired result in several ways. The pressure which it exerts against the os and cervix stimulates uterine contraction, while the presence of the gauze within the cervix tends to further the dilatation of the part.

The expulsion of the ovum may also be hastened by the administration of ergot in small doses, fifteen drops every hour. In many cases under this treatment uterine contractions gradually increase in strength until the tampon and the embryo are expelled together. In other cases the operator removes the tampon to find the embryo adhering to the end of the gauze. If properly applied, the gauze makes efficient pressure, and hemorrhage need not be feared unless the uterus dilates with great rapidity, or unless the staining of the dressing with bright blood indicates the necessity for the renewing of the tampon.

The Diagnosis of Complete Abortion.—By complete abortion is understood the expulsion of the ovum entire. The question as to whether the abortion is complete or incomplete can only be positively determined when all the discharges from the uterus have been subjected to careful examination. In many cases of abortion it is not possible for the physician to obtain the opportunity to examine all of the discharges. Clotted blood is usually thrown out by those who do not understand the importance of such examination, while soiled napkins may be washed or burned. In such cases, before the physician leaves his patient, under the supposition that the abortion is complete, he should satisfy himself that such is the case by examining with the finger the interior of the uterus. If the vagina be thoroughly douched immediately after the expulsion of the embryo, the uterus may be carried downward into the pelvis by suprapubic pressure, while one or two fingers of the aseptic hand may be carried within the uterus and thoroughly explore its cavity. Blood-clots remaining within the womb should be removed, and the finger can ascertain whether the interior of the uterus is empty and smooth, or whether a portion of the ovum is still adherent to its wall. If the latter be true, it should be removed by the finger if possible; but if this cannot be done, the uterus should be emptied by the use of the curette.

It may seem that such exploration of the uterus is unnecessary interference, but, in view of the dangers following the retention of a portion of the ovum, it is far safer to examine more thoroughly under antiseptic precautions than to allow a portion possibly to be retained.

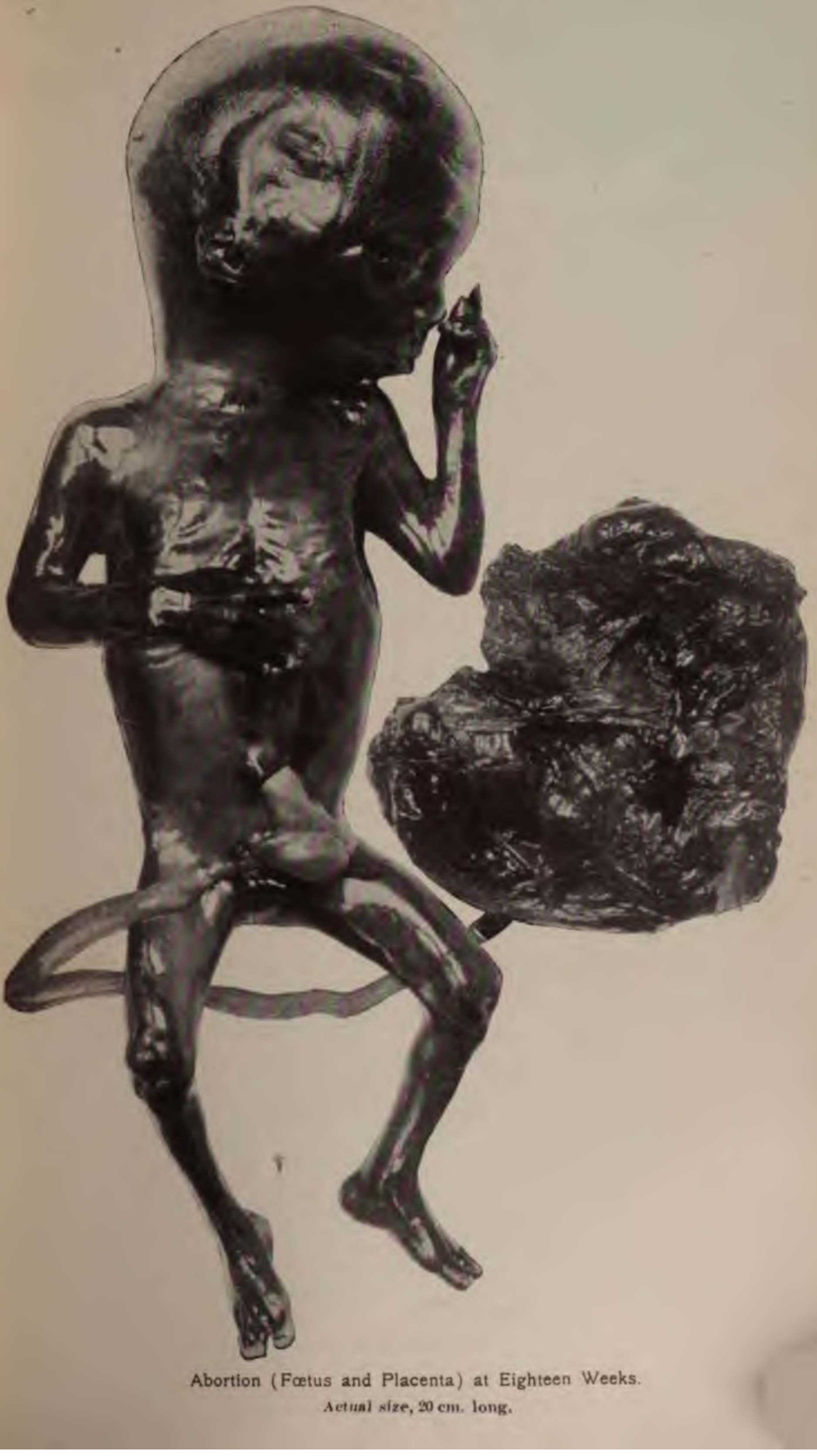
The Diagnosis and Treatment of Incomplete Abortion.—When the embryo cannot be recognized in the discharges, pregnancy being present, and when the uterus remains somewhat enlarged and a slight discharge of blood or sanious matter persists, there is reason for believing that some portion of the embryo is retained within the uterus. If no interference has been practised, the patient's temperature is usually normal; and if the genital tract has been healthy, there is no sign of infection. As the vagina is rarely free from the presence of bacteria, there is great danger that infection will develop, and if there is reason to suspect that the uterus has been interfered with, the patient may be considered as already infected.

Under these circumstances the uterus must be emptied as thoroughly as possible by that method which is least injurious to the patient.

If the patient has lost considerable blood, and is not in good condition to take an anæsthetic and submit to a surgical procedure, the use of the gauze tampon with drugs which cause uterine contraction will usually succeed in bringing about the expulsion of the embryo and its appendages. There is, however, some risk and uncertainty in relying entirely upon this mode of treatment. If the patient is in good condition and there is no contraindication to anæsthesia and operation, the case will be terminated more promptly and certainly by dilating the uterus if necessary and by removing its contents with the curette. This treatment has the additional advantage that in patients who have had chronic endometritis before pregnancy, curetting done for abortion frequently causes a cure of the original lesion.

THE USE OF THE TAMPON OR EXPECTANT PLAN.—Treatment by the tampon is practically that which has been described for the check-

PLATE XII.



Abortion (Fœtus and Placenta) at Eighteen Weeks.

Actual size, 20 cm. long.

ing of hemorrhage occurring during abortion. The vagina having been cleansed by antiseptic solution and the bowels and bladder emptied, a sterile speculum is introduced and a strip of iodoform gauze, 10 per cent., is thoroughly packed, if possible, in the cervix and around the vaginal attachment of the cervix. Firm pressure should be made by the tampon. An occlusion dressing of bichloride gauze should then be applied with a T bandage. A vaginal tampon of bichloride gauze is usually necessary in addition to the cervical tampon of iodoform gauze. Fluid extract of ergot and strychnia in tonic doses will secure uterine contraction, and cause the expulsion of the contents of the womb. At the end of twenty-four hours the gauze should be removed, the vagina thoroughly douched with lysol or creolin, 1 per cent., or bichloride of mercury solution, 1 : 4,000, and the packing renewed. The patient should take liquid food, and the bowels should be thoroughly emptied. Fragments of the embryo and the maternal decidua come away in a few days with this treatment, the decidua often appearing as a cast of the uterine cavity.

THE OPERATIVE TREATMENT OF INCOMPLETE ABORTION.—The patient is prepared for dilatation and curetting by emptying the bladder and rectum, by having the parts shaved, or the hair trimmed closely, by scrubbing the external genital organs thoroughly with tincture of green soap and water, and then with sterile water, and then with bichloride of mercury solution, 1 : 2,000. She is anæsthetized with ether and placed in the dorsal position upon a table. The operator provides for the operation solid or bladed dilators, tenaculum forceps, Sim's or Edebohl's speculum, a curette with or without a hollow stem for flushing, forceps for introducing gauze, and iodoform or sterile gauze in a strip two inches wide and several yards long. Bichloride gauze should also be in readiness. Sterile gauze or gauze wrung out of bichloride solution may be used as sponges. In selecting a curette, the operator must remember that the pregnant womb is easily punctured. This is especially true if infection has occurred. Small, sharply-pointed curettes should never be used. Those with a large loop are preferable. Curettes in which the blade is a cutting loop are useful, provided the distal end of the loop is sufficiently wide to make puncture of the uterus difficult. It is a great convenience to have a curette with hollow stem, which can be used as an intrauterine douche as well as a curette. If the operator decides to wash out the uterus, a clean fountain syringe, with a plentiful supply of sterile salt solution, or lysol, or creolin, 1 per cent., should be in readiness. Very rarely the cervix is injured by such dilatation, and may require the insertion of a catgut stitch. This accident, however, in good hands is very rarely seen. Usually the cervix is sufficiently dilated to permit the introduction of the finger without much difficulty. If the tissues are in such a condition that the operator can reach the fundus of the uterus with his finger, he may press the womb down with one hand and explore its cavity with the index finger of the other. Some prefer to curette with the nail of the index finger. If rubber gloves are worn, the rubber-covered finger is a poor curette, and in many cases the uterus cannot be pressed sufficiently down to enable the finger to reach the fundus. In some patients the pelvic floor is so resisting that access to the uterus is impossible. The cervix may be grasped by the tenaculum forceps, the uterus gently pulled downward, the speculum introduced, and the cervix dilated if necessary. Then, with the curette, without irrigation, the operator goes over all portions of the uterine wall, scraping gently but firmly. The tube of the fountain syringe may then be attached to the curette, and the uterus irrigated until the fluid returns entirely clear. The curetting may be continued during irrigation. The womb should then be tamponed with moderate firmness with iodoform or sterile gauze, a vaginal tampon of bichloride gauze introduced, and an occlusion dressing and T bandage applied. In competent hands this operation gives the best of results. The hemorrhage is less than in cases in which the interference is not practised, accurate diagnosis is made, and the patient, upon recovery, usually enjoys a much better condition of the uterus than before operation. The gauze should be removed from thirty-six to forty-eight hours afterward. Some operators use vaginal douches during convalescence, although in uninfected cases they are unnecessary.

Cases Complicated by Adherent Placenta.—Cases arise in which the placenta may be adherent to the wall of the uterus so firmly that the finger and blunt curette cannot completely remove it. In these cases it is better to use no violence in removing retained tissue, but to make the uterus aseptic and maintain the birth-canal in an aseptic condition until the placenta becomes dislodged by necrosis of the cells of the placenta and uterine decidua. This is to be accomplished by thoroughly douching the uterus with lysol or creolin, 2 per cent., tamponing it with iodoform gauze and tamponing the vagina with bichloride of mercury gauze, 1 : 2,000. The external parts must remain covered by an antiseptic occlusion dressing and be thoroughly cleansed with bichloride solution, 1 : 4,000, after each micturition and defecation. In from thirty-six to forty-eight hours in the majority of cases the placenta will be found loosened, and will often be expelled by the contractions of the uterus. Care should be taken that the womb is maintained in a condition of firm contraction by ergot, fifteen drops every six hours, with strychnine, $\frac{1}{60}$ grain, every six hours. The tampon of iodoform gauze may remain for forty-eight hours in the uterus, but the tampon of bichloride gauze should be renewed in the vagina daily. If thorough antisepsis be practised, the placenta will be expelled, or may be removed without danger to the mother.

Criminal Abortion.—The most dangerous forms of abortion are those termed criminal abortions. They are commonly practised by ignorant persons who know nothing regarding septic poisoning. Any convenient article may be used in an endeavor to rupture the membranes; thus knitting-needles, hairpins, pieces of wire, short sticks, scissors, pieces of whalebone may be employed. Professional abortionists commonly use the uterine sound. They often use a speculum, and their instruments are rarely, if ever, properly sterilized. Injections of irritating substances are often employed for this purpose. Very hot water, vinegar, turpentine, and other irritating solutions are frequently used. An effort is sometimes made to force the finger through the cervix and into the uterus, forcibly dilating the womb.

Treatment.—In dealing with cases of abortion in which the slightest suspicion of criminal interference exists, the physician should examine his patient with great care, making complete notes of any history obtained from the patient or those present about her, and also noting carefully the results of his physical examination. Unless he is positive that the attempt at abortion has been a failure, he should proceed to cleanse thoroughly the interior of the uterus and the entire genital tract. The uterus should be rid of septic infection in the manner described. Clots and portions of an embryo must be carefully kept for examination, and thorough douching and curetting should be employed wherever necessary. If positive evidence of criminal abortion is present, the physician should at once report the case to the proper authorities, placing all evidence in his possession at their disposal. This is especially important in fatal cases, in which the abortionist often abandons the patient, thus endeavoring to place responsibility for death on a reputable physician. Suspicious cases of death with symptoms of abortion should be made coroner's cases and a post-mortem examination held. If physicians will take the trouble to co-operate with the health authorities by promptly reporting cases, much can be done to prevent criminal abortion.

FIG. 54.

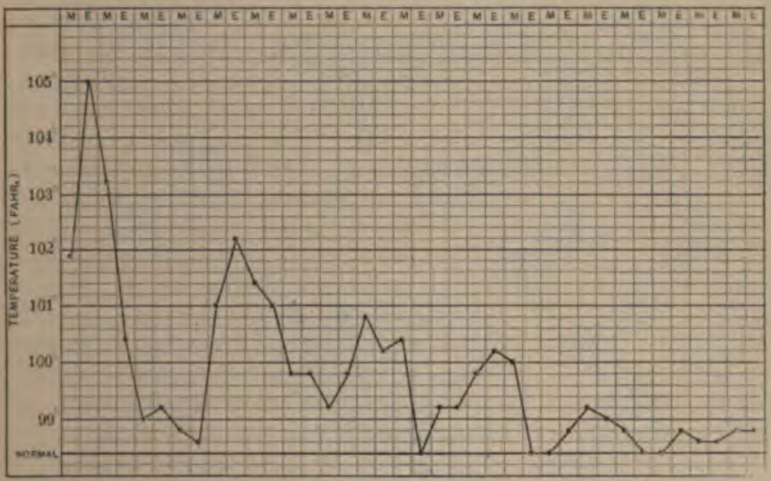


Chart.—Patient admitted to hospital during abortion; infected uterus emptied and disinfected.

Complications.—Cases of criminal abortion which are seen for the first time several days after the abortion may readily deceive the attending physician regarding their nature. Symptoms of inflammation in the pelvis, peritoneum, and cellular tissues are often present, and may completely mask the signs of recent abortion. So frequently is this the case that in examining all cases of septic infection in the pelvic cavity abortion must be excluded as a cause in making accurate diagnosis. Such cases are especially dangerous by reason of the insidious progress of septic infection, and require the most prompt and thorough surgical treatment. The patient may be apparently progressing rapidly to recovery when an abscess in the tube or ovary or broad ligament may burst, followed by rapidly fatal absorption. In large cities cases of criminal abortion furnish the most pronounced types of puerperal septic infection. In treating cases of criminal abortion which are in a desperate condition, a reputable physician is often summoned to a case abandoned by the abortionist. While the first impulse of the physician may be to proceed at once to empty the uterus, it may sometimes be best to delay both in the interests of the patient and to further the ends of justice. Such patients are often greatly weakened by hemorrhages, fright, and infection. They may not be able to bear anæsthesia and immediate operation. The free administration of stimulants for twenty-four or forty-eight hours may put them in much better condition for treatment. This delay also gives the authorities the opportunity to obtain information regarding the case, and possibly to procure the arrest of the perpetrator. The authorities should be promptly notified so soon as a suspicious case is seen, and every effort made to secure the criminal.

Therapeutic Abortion.—Therapeutic abortion is performed in the interests of the mother whose life is in danger by reason of pregnancy. This procedure is justifiable in cases of nausea and vomiting, where rapid anæmia threatens the mother; in cases of acute wasting disease, as tuberculosis; and in rare instances of melancholia and hystero-epilepsy; in toxæmia it is also indicated after appropriate treatment of other sorts has been tried.

The patient should be prepared for the operation in a thoroughly antiseptic manner. She should, if possible, be given a bath, the bowels be thoroughly emptied, the bladder be emptied, and the external genital organs cleansed with soap and water and with bichloride of mercury solution, 1 : 2,000. The field of operation must be surrounded with clean linen. The vagina is to be douched with lysol or creolin, 2 per cent. For the performance of this operation surgical anæsthesia, preferably by ether, is required. The physician will need a pair of double-bladed tenacula, a bladed uterine dilator, solid dilators, an obstetric curette, a curved uterine dressing forceps, and antiseptic gauze. The patient should be placed upon her back or side at the edge of the bed or table, and the cervix seized with the tenaculum forceps and drawn gently downward and backward. If the uterus be anteflexed, it is well to seize the anterior lip of the cervix: while if the womb be retroflexed, the posterior lip should be grasped. In this way the cervical canal will be partially straightened and the uterus emptied more easily. When the uterus has been fixed by the forceps, a gentle effort should be made to pass the tip of the index finger through the os and cervix. If this can be done, the bladed dilator need not be used, but the womb may be opened by employing the solid dilators in graded sizes. Dilatation should be practised slowly and carefully, care being taken to avoid injuries to the tissues. It is of value to have the uterus pressed gently downward by suprapubic pressure at the hands of an assistant. Dilatation should be carried sufficiently far to permit the introduction of the obstetric curette, and also of the gauze drain. When this is accomplished, the uterus should be thoroughly emptied by the douche curette and tamponed with iodoform gauze. The vagina should be tamponed with bichloride of mercury gauze, 1 : 2,000. An occlusion dressing must be worn, and the patient treated antiseptically in the usual manner. If thorough antisepsis be practised, therapeutic abortion adds but little to the risks of the mother if carefully done. Otherwise it is often more fatal than the condition from which it seeks to deliver her.

Other methods of producing abortion are in use. The most efficient are those which seek to dilate the uterus and excite uterine contraction. Such are the use of laminaria tents, dilatation with gauze tampons, or by the use of the finger or bladed dilators. The best of these is the employment under antiseptic precautions of the gauze tampon, aided or preceded by dilation with the finger.

Abortion is sometimes produced by rupturing the membranes, which allows the amniotic liquid to escape and is followed by uterine contractions. The administration of ergot, frequent hot douches, and the use of electricity are also practised for the same purpose. It is extremely doubtful if any drug, when given in doses not sufficiently large to produce poisoning, has the power to bring on abortion in a healthy patient. Remarkable cases are on record in which women have taken many times the ordinary dose of ergot, quinine, and other drugs supposed to cause abortion, without success. Secret preparations sold for this purpose are useless in healthy patients, unless taken in such quantities as to produce irritant poisoning. One of the most commonly used of these preparations is the oil of tansy. If delay must be avoided, the production of abortion is best accomplished when conducted as a surgical procedure. If haste is not imperative, gradual dilatation under antiseptic precautions by the gauze tampon, aided by uterine contractions, stimulated by ergot or quinine, is an efficient method. Others may be successful, but cannot be depended upon, and are attended with greater risk.

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The determination to produce therapeutic abortion must be based upon unassailable grounds. It is well to have the decision of the original attendant confirmed by a consultant. The family or friends of the patient should be informed of the conditions which make the abortion imperative. Other methods of treatment should not have been neglected.

Recovery from Abortion.—It is especially important that patients recovering from abortion should take every precaution to secure a complete recovery before returning to their usual avocations. Abortion is often considered a trivial matter, and the patient is strongly tempted to be up and about in a few days, or, at most, ten days or two weeks, after this accident. The conditions, however, for perfect recovery are far less favorable than after delivery at full term. The uterine muscle is but partially developed, and hence contraction and retraction of the uterus are very imperfectly performed. The decidual membranes are not ready to separate from the wall of the womb, and hence infection and endometritis are readily set up. It is very rare for an abortion to be absolutely complete, and retained decidua or chorion may remain within the womb. In rare cases only the chorion is discharged, and the embryo may be retained for some time in the uterus. The hemorrhage which occurs during abortion is often greater than that which accompanies a well-conducted normal labor. In addition to these factors, the mental condition of the patient is usually that of depression. If the abortion is a criminal one, the circumstances are all unfavorable for recovery; while if it occurs in a married woman, the unhappiness of disappointment is added to physical burdens. When these factors are taken into consideration, it is readily seen that, even if infection is avoided, the patient after abortion requires quite as much care and quite as long a time to secure recovery as after labor. While physicians cannot control their patients in many of these cases, still it remains their duty to endeavor earnestly to secure proper care for these cases.

Menstruation after Abortion.—In many cases the first menstruation after an abortion is more profuse than normal. Little pain is usually experienced at this time, and additional rest is usually sufficient to control the loss of blood. The patient should be cautioned, however, to avoid undue exertion at this time.

PREMATURE LABOR.

The cause of premature labor may be found in mental or physical disorder on the part of the mother, or some disease which disturbs her power of oxygenation of the fœtal blood, or in an affection of the fœtus which interferes with its nutrition or causes its life to cease.

Symptoms.—The symptoms of premature labor are uterine contractions, a gradual opening of the womb, and the phenomena observed in normal labor. As the tissues of the cervix are not in the physiological condition present at the normal termination of pregnancy, the first stage of labor may be prolonged. If the membranes are retained unbroken until dilatation is complete, labor is usually easy, because the child is small. If, however, the membranes rupture early in the labor, the birth may be tedious and exhausting to the mother.

Treatment.—In cases of premature labor manipulations within the uterus are often more difficult than in cases at term. The uterus, being imperfectly developed, is less elastic than in normal cases, the fœtus is often friable and is easily ruptured, while the entire birth-canal is much less dilatable than at the end of gestation. It is often much more difficult to extract a small and partly macerated fœtus from one of these cases than in a patient at full term.

When dilatation is but partially complete, the use of the elastic bag or the intrauterine tampon of aseptic gauze will be found of great advantage. If the fœtus has perished, there is no hurry because of the endeavor to secure a living child. It is better for the operator to take time to secure full dilatation than to do violence to the womb in an unsuccessful attempt to remove entirely a small fœtus.

The treatment of premature labor consists in the usual precautions taken in normal cases, while especial care is needed to avoid a rupture of the membranes. The fœtus may be expelled and the placenta retained by firm contraction of the uterus. If no hemorrhage is present and the patient be kept in an antiseptic condition, delay may be practised until the uterus expels the placenta. If, however, the placenta is partially separated and bleeding occurs, the patient must be anæsthetized, the uterus dilated, and the placenta completely removed.

The Care of the Child.—Should the child live after premature labor, its care requires skill and patience. If threatened with exhaustion, it should be placed in an incubator and kept there until it has arrived at the usual term of birth. If the child is too feeble to suck, it may be fed by a pipette with breast-milk pumped from the mother's breast. Such children must be bandaged in cotton, and care taken to avoid exposure to cold and unnecessary handling.

With these precautions, many prematurely born children may be saved. In cases where the child cannot swallow, it may be necessary to introduce milk into the stomach through a small, soft catheter, to which is attached a small funnel. This, however, is rarely needed, as the child will usually take milk by the pipette.

By these methods of treatment the age of viability for prematurely born children has been advanced to six and one-half months.

Fœtal Mortality after Premature Labor.—There remains in the minds of many persons an abstract tradition, which has no basis in fact, regarding the vigor and chances for life of children born at seven and eight months respectively. For no good reason there exists a belief that a seven-months child is more likely to survive than is an eight-months child. The source of this belief is not easy to trace, except for the fact that many premature births happen at about seven months, and that the number seven is curiously attached to several traditions regarding reproduction and descent. It is obvious that the longer the fœtus remains in the mother's womb without injury or disease the more perfect will be its development, and the greater must be its vigor. Many children are born at eight months who are not recognized as premature children. Such infants, in the majority of cases, survive, and because their premature birth is not recognized they are not compared with children born earlier in gestation. The duration of pregnancy differs so greatly in different patients that many children considered at full term would be found, on critical examination, to be really prematurely born.

CHAPTER XXI.

PREGNANCY COMPLICATED BY CONCEALED OR ACCIDENTAL HEMORRHAGE.

UNDER the title concealed or accidental hemorrhage has been described bleeding from any portion of the genital tract occurring during pregnancy. As most of these cases follow premature and accidental separation of the placenta, this accident is usually described as a case of concealed hemorrhage. There are, however, other sources beside separation of the placenta for accidental concealed hemorrhage in pregnancy. An enlarged and distended vein in the broad ligament may rupture as the result of violence. In this case the hemorrhage would be both accidental and concealed, and this accident could only be confirmed through abdominal section. Visible accidental hemorrhage during pregnancy may follow the bursting of varicose veins in the vulva or vagina, or the rupture of varicose veins in the lower extremities.

There may be other sources of hemorrhage in pregnancy beside the genital organs. Dilated varicose veins of the esophagus may rupture, gastric ulcer complicating pregnancy may open vessels in the stomach, causing bleeding.

It is usual to consider the hemorrhage from placenta prævia or from ectopic gestation under separate headings:

Hemorrhage from Separation of the Placenta.—The frequency of this accident is variously estimated. Only approximate statistics are available, and these vary from 1 to 1½ per cent. in a considerable number of cases.

Etiology.—Of great importance in causing this accident is the pre-existing condition of the endometrium and maternal decidua. Those conditions which produce arterio-sclerosis, with subsequent degeneration of vessels, operate in these cases as a powerful factor in making possible the premature separation of the placenta. Thus toxæmia, of renal or hepatic origin, syphilis, and chronic endometritis, of whatever nature, are important factors. On the side of the fœtus, degenerative changes in the placenta, from whatever cause, or pathological conditions in the cord and membranes also predispose to this accident. Polyhydramnios and shortness of the cord must be recognized in this connection. Direct violence is obviously an important factor. A severe jar, caused by a fall or misstep, a sudden and unexpected strain, a shock or blow, a railway or carriage accident, excessive retching and straining, and violent uterine contractions following great mental agitation, must all be included as causes. Excessive movements in the fœtus, accompanied by coiling of the cord about the child and traction upon the cord, may partially or wholly separate the placenta. The induction of labor, in which bougies or other appliances are inserted within the womb, may also separate the placenta.

Signs and Symptoms.—The signs and symptoms of hemorrhage following placental separation will depend somewhat upon the situation of the placenta, and also the location in the placenta of the portion which is separated. If the placenta be situated at the lower portion of the expulsive uterine segment, blood will more quickly find its way into the vagina than if the placenta be situated higher up. If that portion of the placenta where separation occurs be at its lower border, and not upon the side of the placenta which is nearest to the fundus, blood will make its way more easily into the vagina. When, however, the placenta is situated high in the uterus and separates near its centre, persistent oozing may cause the formation of a large clot, and a considerable and serious hemorrhage may occur without visible sign. A discharge of blood from the vagina cannot, then, be considered as an invariable symptom of this condition.

So soon, however, as considerable hemorrhage occurs, the uterus manifests muscular irritability. Clotted blood, acting as a foreign body, excites the uterine muscle to contraction. The uterus is hard, painful to the touch, and does not contract in the rhythmical manner characteristic of labor. The condition of the fœtus is obscured by the unusual rigidity of the uterus. If hemorrhage persists, the mother becomes exhausted; the uterine muscle will share in her exhaustion and become relaxed and flabby.

The cardinal signs and symptoms of hemorrhage are present in varying degree. The pulse increases in rapidity, the patient's pallor increases, vascular tension drops, the skin becomes relaxed and moist, the pupils are often dilated, air-hunger, thirst, restlessness, dyspnœa, and partial loss of vision are present, and shock develops as hemorrhage proceeds. A vaginal examination, combined with suprapubic pressure, will detect the fact that the uterus is boggy, flabby, and relaxed; fœtal movements are at first unduly active and gradually cease. Fœtal heart-sounds are at first quickened, and finally disappear. In some cases considerable pain and straining are aroused by the increasing blood clot. A woman who has borne children may believe that a very active labor is about to occur. In other cases the patient soon fails to recognize the characteristic movements of the child, and has no expulsive phenomena.

Natural History.—In cases where but a small portion of the placenta separates at the lower margin, a thin blood clot may form upon the separated surface of the placenta. The remainder may continue adherent to the wall of the uterus, and further separation and hemorrhage may cease. When the separation occurs higher up in the placenta, clotted blood will accumulate between the uterus and the placenta, separation will slowly increase, blood clot continually becomes larger, until finally the uterus is roused to contraction and expels its contents with profuse loss of blood, followed by rapid fatal anæmia and syncope. This may well be illustrated by the following case from the records of the Jefferson Maternity: A multipara between eight and nine months pregnant had slight vaginal hemorrhage following exertion. Upon lying down the hemorrhage ceased. She declined to enter the Maternity. She was cautioned to remain recumbent and to summon aid if hemorrhage recurred. She did not continue to lie down, but did the household work of her family. Hemorrhage would recur and she would feel somewhat faint, but hemorrhage would cease and the patient felt better when she reclined. After a few days a rather severe hemorrhage occurred, and the patient felt so faint that she summoned assistance. She was at once conveyed by ambulance to the Maternity. On examination, fœtal heart-sounds were absent, the uterus was in a condition of partial contraction, relaxing at intervals. The patient was in shock, with feeble, rapid pulse, and threatened syncope. When the uterus was emptied, several basinsful of clotted blood were expelled, accompanied by a dead fœtus and a placenta which had separated over the larger portion of its surface. In spite of stimulation and intravenous transfusion, the patient soon died in acute anæmia.

Treatment.—Evidently such a patient is not safe until the uterus is empty. In cases where the placental separation is not extensive, and occurs at the lower border of the placenta, hemorrhage can be largely or completely checked by rupturing the membranes and by causing the uterus to contract strongly. In cases where considerable separation is present, the uterus must be emptied as soon as possible by that method which exposes the mother to least shock. During and after the emptying of the uterus, the mother must be stimulated and supported in every possible manner.

If the physician is without assistants in such a case, his best procedure is to dilate the cervix sufficiently with his finger to permit access to the membranes, and then with a pair of closed uterine forceps to make as extensive a tear in the membranes as he can. If the patient's condition is good and the uterus responds to stimulation, tonic doses of strychnia and ergot may be given, and when the uterus contracts hemorrhage will cease.

After the rupture of the membranes, it is of considerable value to introduce within the cervix an elastic dilating bag. This prepares the way for delivery and stimulates uterine contraction. McLean's bag is most convenient, although DeRibe's or Barnes' may be used if desired. While the uterus is contracting and the bag is assisting dilatation, the physician will have time to secure such assistance as is necessary to complete delivery.

To completely empty the uterus in these cases, the operator must have a skillful anæsthetizer and assistant. He should be prepared to use the forceps, to perform craniotomy, to do version, and to practise intravenous saline transfusion. Instruments necessary for the antiseptic irrigation of the uterus and gauze packing must also be at hand. Strychnia and ergot must be used hypodermatically, and atropin if indicated. So soon as possible the patient should be controlled by partial or complete anæsthesia with ether. Under thorough antiseptic precautions, the operator completes the dilatation of the cervix, if possible, with the fingers and hand. Should extraordinary resistance be encountered, Bossi's dilator may be employed, or Dührssen's method of incision of the cervix may be practised. When dilatation is sufficient, the forceps, if possible, should be used to complete delivery. Should disproportion between the head and the pelvis exist, craniotomy is indicated. Version is less desirable, as it exposes the uterus to more disturbance, and during its performance may be accompanied by free hemorrhage.

When the fœtus is extracted, clotted blood and often the placenta accompany the child. If the child be living, its care should be given to an assistant. The operator should at once introduce the hand, made thoroughly aseptic or covered by a sterile glove. Placenta, membranes, and blood clot should be gently but thoroughly removed from the uterus, irrigation with hot normal salt solution or 1 per cent. lysol should immediately follow, and the uterus should be completely and firmly tamponed with iodoform gauze. If the cervix is sufficiently lacerated to bleed, this hemorrhage should be stopped by catgut suture. The vagina should be tamponed with dry bichloride gauze. During the extraction of the fœtus, tonic doses of strychnia and ergot should be given by hypodermatic injection. If the patient is in a serious condition, intravenous saline transfusion should be commenced so soon as the womb is emptied. If respiration seems sluggish, atropin by hypodermatic injection is indicated. The patient should be placed with the head as low as possible, the uterus should be gently but firmly held by an assistant, and the patient surrounded by external warmth. A rectal injection of whiskey and normal salt solution will be beneficial. Lacerations in the pelvic floor and vagina must be neglected for the moment, as the danger to the mother is too great to permit delay for their repair.

Mortality.—Storer,[172] from 46 cases under his own observation and those reported by Goodell and Braxton Hicks, making a total of 153, found that 46.7 per cent. of the mothers died and 94 per cent. of the children. Holmes[173] reviewed 200 cases in the literature, reporting 2, with a maternal mortality of 32.2 per cent. and an infant mortality of 85.8 per cent.

A study of these reports shows clearly that the mortality is greatly lessened by proper treatment. While the mortality depends very

[172] Storer: Boston Medical and Surgical Journal, p. 377-379, 1892.
[173] Holmes: American Journal of Obstetrics, No. 6, 1901.

largely upon the degree of placental separation and the extent of the lesion which make this possible, still the clinical fact remains that careful attention and prompt treatment are imperative in these cases.

In maternities where abdominal section can be promptly practised, if the patient is in good condition, delivery by Cæsarean section is justifiable in the interests of the mother and child. Care must be taken before resorting to section that the fœtus is found in good condition; its heart-sounds must be distinctly perceptible and of average strength.

Maternal Morbidity.—The hemorrhage which occurs in these cases greatly predisposes to septic infection, hence the utmost care must be taken in conducting such cases, and thorough antisepsis is imperative. The necessity for rapid delivery favors laceration, and such injury must be repaired so soon as the condition of the patient justifies it.

Hemorrhage from the Uterus.—In rare cases hemorrhage, becoming profuse, may occur during pregnancy in cases in which the blood escapes from the uterus into the vagina. It may be almost impossible to distinguish between such a case and that hemorrhage caused by separation of the placenta. In placental separation fœtal heart-sounds rapidly fail, while in hemorrhage without placental separation the fœtus shows the influence of the bleeding much less. Fatal hemorrhage from the uterus without separation of the placenta has been observed in some cases of chronic nephritis.

The treatment of this condition consists in putting the patient at absolute rest; hydrastin or stypticin may be used in the effort to control the bleeding. Emptying the uterus has little effect upon these cases, for if the lesions are severe hemorrhage will still persist.

Concealed Accidental Bleeding from Ruptured Veins in the Broad Ligament.—The differential diagnosis between ruptured veins of the broad ligament and hemorrhage from ruptured ectopic gestation would be difficult. In hemorrhage from ruptured veins of the broad ligament the bleeding is sudden, copious, and quickly brings the patient into a condition of shock. There is less pain than is often seen in ruptured ectopic gestation.

The only efficient treatment for this accident exists in prompt abdominal section, with ligation of the ruptured veins. The use of salt solution freely in the abdominal cavity or by intravenous transfusion and stimulation in other available ways are also indicated. The decision to operate must be based upon constitutional signs of severe hemorrhage, and the fact that it can be demonstrated that the bleeding is not intra-uterine, but intra-abdominal.

Hemorrhage from Ruptured Varicose Veins of the Vagina or Vulva.—In anæmic multiparæ, or in primiparæ having weak blood-vessels, the veins of the vagina may become varicose and greatly distended. In this condition any considerable violence may rupture one of these veins. A fall or blow or wound in this region is followed by severe bleeding.

Diagnosis and Treatment.—A neglected case of this sort may present at first some difficulty in diagnosis through the excessive accumulation of clotted blood. This may conceal the condition of the vaginal vessels, and the hemorrhage may be supposed to be from the uterus. When the parts are thoroughly cleansed and the blood is sponged away, the origin of the hemorrhage is evident.

Such bleeding may be controlled by passing a catgut ligature deeply beneath the mass of veins with a large, fully-curved needle. Moderate pressure by ligation is usually sufficient to check the hemorrhage. The vagina should be moderately tamponed with iodoform gauze, but the mistake should not be made of applying strong pressure in the upper portion of the vaginal canal. If this is done, bleeding from ruptured veins is increased. A firmly applied occlusion dressing of antiseptic gauze should be placed over the vulva and pressure made by a T bandage.

Hemorrhage during Pregnancy from Varicose Veins of the Lower Extremities.—Varicose veins of the lower extremities may become enormously distended and rupture. The hemorrhage may be severe, and in the hands of persons ignorant of the principles of surgery a case may become serious.

Treatment.—The patient should at once be placed upon her back and the extremity from which the hemorrhage occurs raised as high as possible. The point of bleeding should be cleansed with an antiseptic solution, a compress of antiseptic gauze applied, and the entire extremity, from the toes to the groin, enveloped in a smoothly-fitting bandage. Should the case be severe, the ruptured vein may be ligated in two places above and below the point of rupture.

It is usually best to avoid a surgical operation for varicose veins of the lower extremities during pregnancy. In extreme and aggravating cases such operation may be considered. Dissecting out of the worst varices under antiseptic precautions is the method indicated in these cases.

In cases where rupture threatens and the patient is obliged to be upon her feet, a compress of antiseptic gauze in a sterile packet should be given to the patient, with a gauze or flannel bandage. She should be instructed to keep this in readiness, and when rupture occurs to immediately lie down, have the compress put upon the point of rupture, and the extremity bandaged from the foot up.

Hemorrhage from Ruptured Varices of the Œsophagus: Hemorrhage from Gastric Ulcer.—Should these accidents occur during pregnancy, the treatment appropriate for them in those who are not pregnant may be applied. Pregnancy furnishes no positive contraindication to either medical or surgical treatment appropriate in these cases.

Hæmoptysis.—In pulmonary tuberculosis and in degeneration of the heart muscle, with valvular disease, severe hemorrhage may occur during pregnancy. Such bleeding is most apt to appear at the time when the patient would have menstruated if pregnancy were not present. The usual signs of cardiac and pulmonary disease are present in these patients.

Treatment.—In cases of advanced heart and lung disease the interruption of pregnancy may be necessary in the interests of the mother. In milder cases the patient should be put at absolute rest, and those remedies employed which are usually successful. The fœtus will usually survive considerable maternal bleeding in these patients. Recovery may ensue under most discouraging circumstances.

CHAPTER XXII.

PLACENTA PRÆVIA.

Definition.—One of the most dangerous conditions causing uncontrollable bleeding is abnormal insertion of the placenta, known as placenta prævia. By this we mean the attachment of the placenta to such a portion of the womb that its separation during dilatation is inevitable. If the placenta be attached at the lower segment or at the cervix, it is placenta prævia. These cases may be classified in various ways: an ordinary division is that of central placenta prævia, when the placenta is directly over the internal os. This is naturally the most dangerous of all. By partial placenta prævia we understand such an attachment of the placenta that a portion of it projects over the internal os. By lateral placenta prævia we refer to an attachment of the placenta upon the wall of the lower uterine segment, just above the internal os; while by marginal placenta prævia we understand the situation of the placenta at the margin of the internal os. While these different varieties are not always perfectly developed, still the classification is of use in studying these complications.

Etiology.—The causes of placenta prævia are found in a relaxed condition of the uterus and an abnormal state of its lining membrane, which permit the impregnated ovum to descend to the lower portion of the womb, instead of becoming adherent and developing in its normal situation. Women who have borne children rapidly are liable to placenta prævia, while primigravidæ of poor development and relaxed uterus seem also predisposed to this complication.

Time of Development.—While symptoms of placenta prævia do not usually become manifest before the fifth or sixth month of gestation, the condition may be fully established at an early period of pregnancy. Whenever the placenta is formed, it may be a placenta prævia. Hence, hemorrhage occurring in early pregnancy may be referred to this condition if the pregnancy is sufficiently advanced to permit the formation of the placenta. (Plates XV and XVI.)

Signs and Symptoms.—The symptoms of placenta prævia are hemorrhage from the uterus during pregnancy. The period of pregnancy at which the bleeding will occur depends upon the situation of

PLATE XV.

FIG. 1.

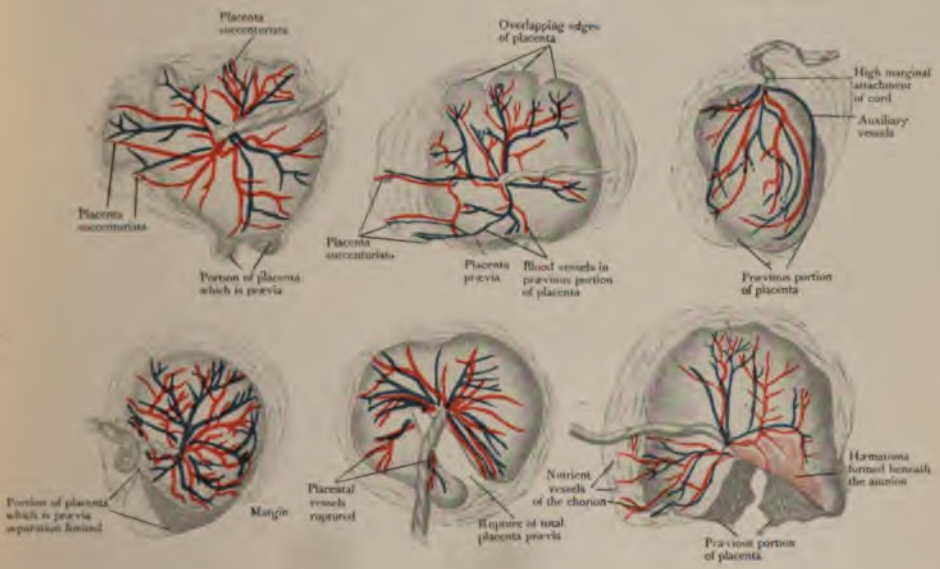
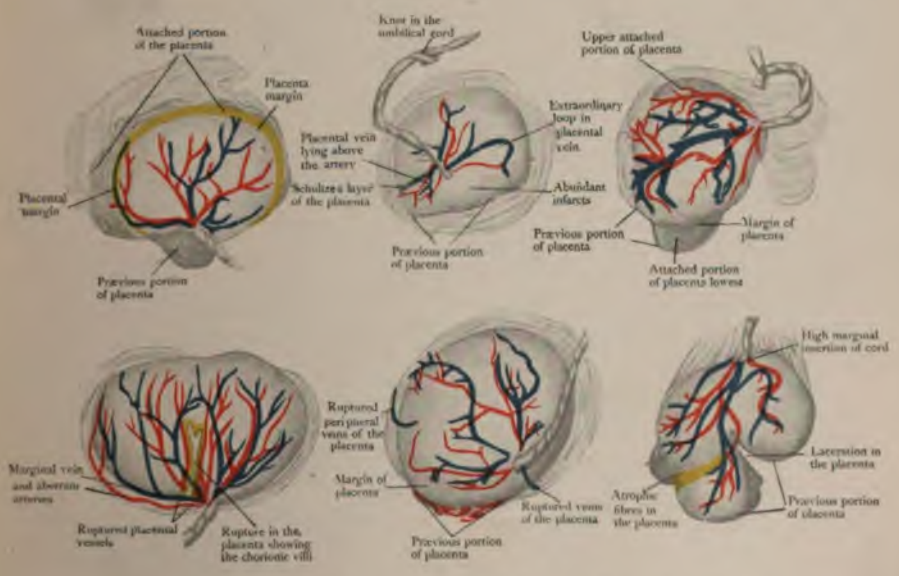

Placenta succenturiata
Overlapping edges of placenta
High marginal attachment of cord
Auxiliary vessels
Placenta succenturiata
Placenta succenturiata
Portion of placenta which is prævia
Placenta prævia
Blood vessels in prævious portion of placenta
Prævious portion of placenta
Portion of placenta which is prævia separation finished
Margin
Placental vessels ruptured
Rupture of total placenta prævia
Nutrient vessels of the chorion
Hæmatoma formed beneath the amnion
Prævious portion of placenta

FIG. 2.


Attached portion of the placenta
Knot in the umbilical cord
Upper attached portion of placenta
Placenta margin
Extraordinary loop in placental vein
Placental vein lying above the artery
Placental margin
Schultze's layer of the placenta
Abundant infarcts
Prævious portion of placenta
Margin of placenta
Prævious portion of placenta
Prævious portion of placenta
Attached portion of placenta lowest
High marginal insertion of cord
Ruptured peripheral veins of the placenta
Laceration in the placenta
Marginal vein and aberrant arteries
Margin of placenta
Atrophic fibres in the placenta
Ruptured veins of the placenta
Prævious portion of placenta
Ruptured placental vessels
Rupture in the placenta showing the chorionic villi
Prævious portion of placenta

The Placenta in Placenta Prævia, Showing the Bloodvessels. (STRASSMAN.)

PLATE XVI.

FIG. 1.

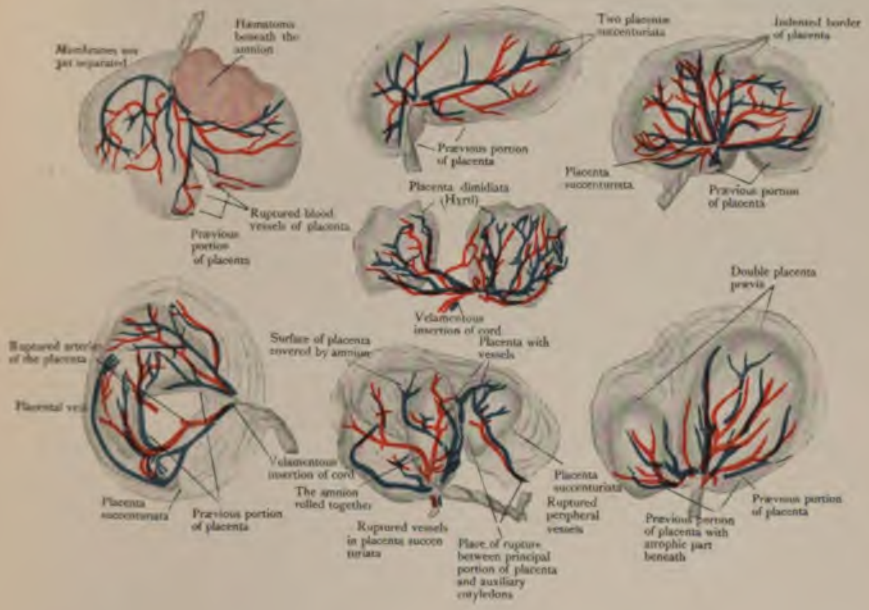
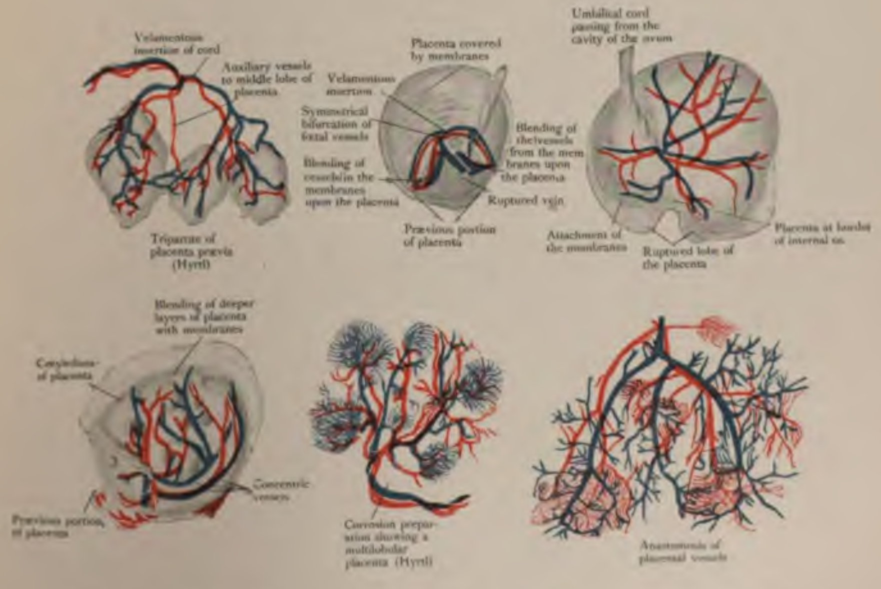
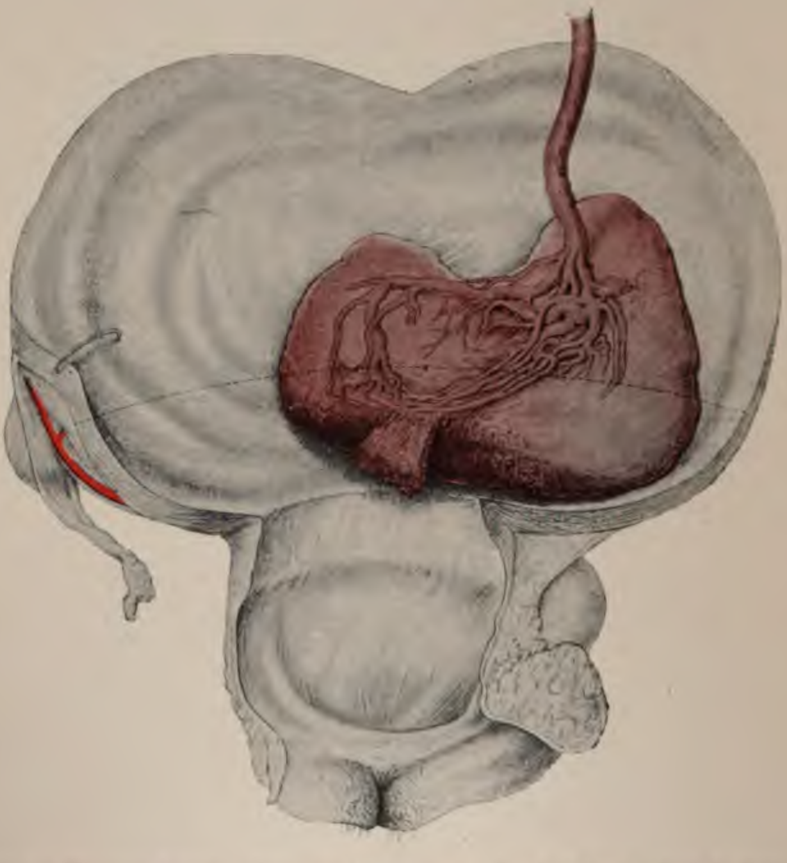

Membranes not yet separated
Hæmatoma beneath the amnion
Ruptured blood vessels of placenta
Prævious portion of placenta
Two placentæ succenturiata
Prævious portion of placenta
Indented border of placenta
Placenta succenturiata
Prævious portion of placenta
Placenta dimidiata (Hyrtl)
Velamentous insertion of cord
Double placenta prævia
Ruptured arteries of the placenta
Placental vein
Velamentous insertion of cord
Placenta succenturiata
Prævious portion of placenta
Surface of placenta covered by amnion
Placenta with vessels
The amnion rolled together
Ruptured vessels in placenta succenturiata
Place of rupture between principal portion of placenta and auxiliary cotyledons
Placenta succenturiata
Ruptured peripheral vessels
Prævious portion of placenta with atrophic part beneath
Prævious portion of placenta

FIG. 2.


Velamentous insertion of cord
Auxiliary vessels to middle lobe of placenta
Tripartite of placenta prævia (Hyrtl)
Placenta covered by membranes
Velamentous insertion
Symmetrical bifurcation of fœtal vessels
Blending of vessels in the membranes upon the placenta
Blending of the vessels from the membranes upon the placenta
Ruptured vein
Prævious portion of placenta
Umbilical cord passing from the cavity of the ovum
Attachment of the membranes
Ruptured lobe of the placenta
Placenta at border of internal os
Blending of deeper layers of placenta with membranes
Cotyledons of placenta
Concentric vessels
Prævious portion of placenta
Corrosion preparation showing a multilobular placenta (Hyrtl)
Anastomosis of placental vessels

The Placenta in Placenta Prævia, Showing the Bloodvessels. (STRASSMAN.)

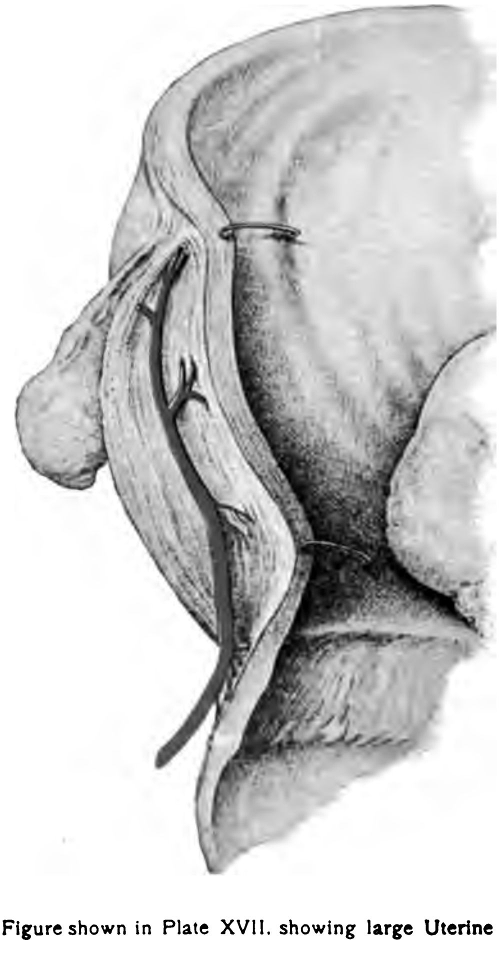
PLATE XVII.



Central Placenta Prævia. Version and Extraction. Death of Mother from Anæmia.
(RUNGE.)

Showing placenta and large size and course of uterine artery.

PLATE XVIII.



Side View of Figure shown in Plate XVII. showing large Uterine Artery. (RUNGE.)

the placenta. Thus, in central placenta prævia bleeding may take place as soon as the placenta is developed, while in other cases, where the placenta is higher up, no blood may be lost until labor actually begins. The manner in which bleeding occurs from this condition is significant, and should arouse suspicion. There is no history of violence nor strain in these cases. The patient often finds that when the bowels or bladder are emptied, and without difficulty, that bright red blood is suddenly discharged without pain. A little care will enable the physician to distinguish between blood from hemorrhoids and blood from placenta prævia. As pregnancy advances this bleeding is more frequent, and, if the placenta is central, it increases in amount. It may finally become continuous and the patient perish in a few hours unless promptly treated. In other cases where the placenta is higher in the uterus the discharge of blood is often slight, and may occur at considerable intervals. The amount may not be sufficient at any one time to occasion anxiety. (Plates XVII and XVIII.)

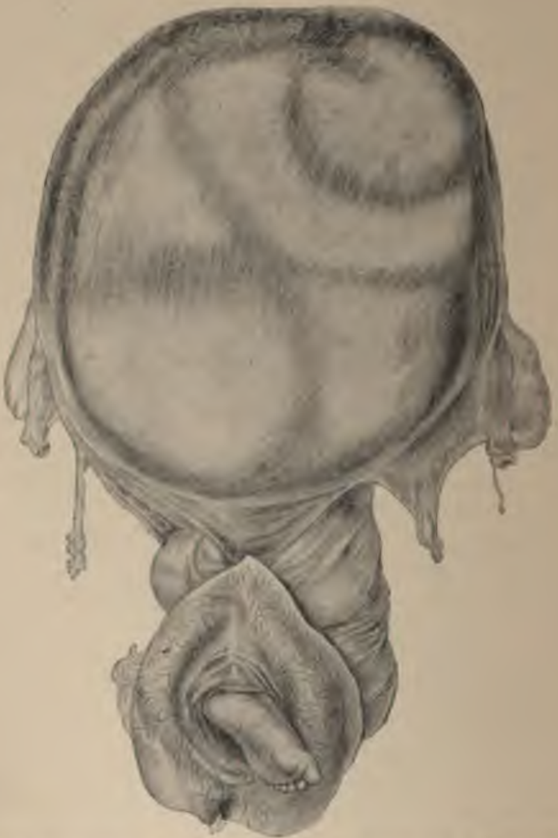
Diagnosis.—The occurrence of bleeding from a pregnant patient demands a thorough examination. The index finger of the aseptic hand should be carefully inserted within the external os, and, if possible, carried through the internal os. If the placenta is central, the finger will go against a pulpy mass, feeling somewhat like raw, tender meat. If the placenta be higher up, only the edge may be found, or it may not be located by such examination. If labor has begun and one or two fingers can be readily carried within the os, the diagnosis of central placenta prævia is readily made, while that of another variety may be more difficult.

On vaginal examination, the bloodvessels of the cervix and vagina in the region nearest to the attachment of the placenta are found unduly dilated and pulsating with unusual vigor. Sometimes a sensation of increased heat in this portion of the body can also be detected. Where the tissues are thin and relaxed, the placenta can, in some cases, be palpated by vaginal examination as a distinct body lying in the lower portion of the uterus. When the finger is withdrawn from such an examination in cases of placenta prævia, it has usually upon it bright blood.

Those varieties of placenta prævia which are not central may often be diagnosticated by careful and systematic auscultation. When the examiner finds a considerable area upon one side of the uterus, near Poupart's ligament or above the pubes, over which the uterine souffle is especially distinct, he may reasonably conclude that the placenta has a low attachment. When, in addition to auscultation, the contour of the uterus is such as to show the situation of the placenta in its lower portion, the diagnosis of placenta prævia may safely be made.

In diagnosticating placenta prævia it must be remembered that a granular condition of the mucous membrane of the cervix may give rise to hemorrhage, which has been mistaken for bleeding from the placenta. In these cases, however, the discharge of blood is slight, although persistent; is mixed with mucus, and is readily excited by any manipulation about the cervix. A positive diagnosis can be made by examining the os and cervix with a speculum, when the condition of the cervical mucous membrane becomes apparent.

FIG. 55.



Placenta prævia and breech presentation. Placenta in lower uterine segment and internal os. (RUNGE.)

Cases of large hemorrhoids, which bleed freely, may occasion difficulty in diagnosis if the patient be pregnant, and may give rise to the suspicion of placenta prævia. A thorough examination and inspection will clear up the diagnosis.

Treatment of Central Placenta Prævia.—The treatment of placenta prævia demands the closest attention and the best skill of the physician. In central placenta prævia the patient is never safe until the uterus is emptied. The life of the child is lost in the great majority of cases of central placenta prævia, and the mother's life is in imminent danger. Unless strict surgical antisepsis be observed, septic infection may readily occur. In cases of central placenta prævia no delay should be practised as soon as the diagnosis is established. Labor is to be induced and the uterus emptied as promptly as possible. This procedure will demand the personal attention of the physician from beginning to end, as each step of the process is fraught with its own danger.

To manage these cases successfully, the operator requires elastic uterine dilators of various sizes, antiseptic gauze, uterine dressing forceps, obstetric forceps, scissors, and in some cases instruments required for abdominal section. Elastic dilators are especially valuable in these cases. The bladder and rectum having been emptied and the vagina made aseptic, if no dilatation is present, the uterus must be dilated sufficiently to admit the finger. When the finger can enter, a strip of antiseptic gauze should be thoroughly packed in the cervix and through the internal os, and also about the cervix at the upper end of the vagina. As this packing must be very thoroughly done, it is better to use partial anæsthesia if necessary to perform it properly. The entire vagina should be packed tightly enough to make firm pressure against the os and cervix. An occlusion dressing must be applied over the vulva and kept in place by a bandage. It is also essential that the uterus contracts firmly, thus making pressure against the placenta from within. To preserve a tonic condition of the uterine muscle, strychnia may be given and fluid extract of ergot, ten drops every hour. Uterine contractions will usually follow tamponing and giving of ergot. The vulvar dressing should be inspected every hour, and when blood makes its appearance upon this dressing it is time to interfere and to renew the tampon.

In renewing the tampon, the operator must remember that the ultimate purpose of his interference is to empty the uterus. The process of dilatation should be carried only so far as will permit the introduction of the hand and the extraction of the child. When the gauze is removed from the vagina, the operator must be prepared to renew the tampon instantly or to introduce the hand, perforate the placenta, perform version, and deliver. If, when the gauze is removed, it is found that the hand cannot be introduced, an elastic bag may be selected, or gauze may again be used. Of the two, the more reliable is the gauze, as it fits perfectly, is not readily dislodged, and favors the formation of a blood clot upon its surface. Under careful antiseptic precaution, the tampon may again be removed and the vulvar dressing reapplied. If the patient be carefully watched and the packing be done efficiently, no dangerous amount of blood will be lost, and sooner or later the physician will be able to introduce the hand, rupture the membranes, make version, and deliver.

In cases of placenta prævia in which the head is presenting, if, when the placenta is torn through by the physician, the head immediately descends and engages closely in the pelvis, delivery should be promptly effected by forceps. The effort to push back the child in such a case and to perform podalic version would cause increased hemorrhage, with the risk of injuring the uterus. As soon as the child is drawn into the pelvic canal by forceps, severe hemorrhage must cease, and the greatest danger to the mother is past. In these cases it is occasionally possible to save the life of the child.

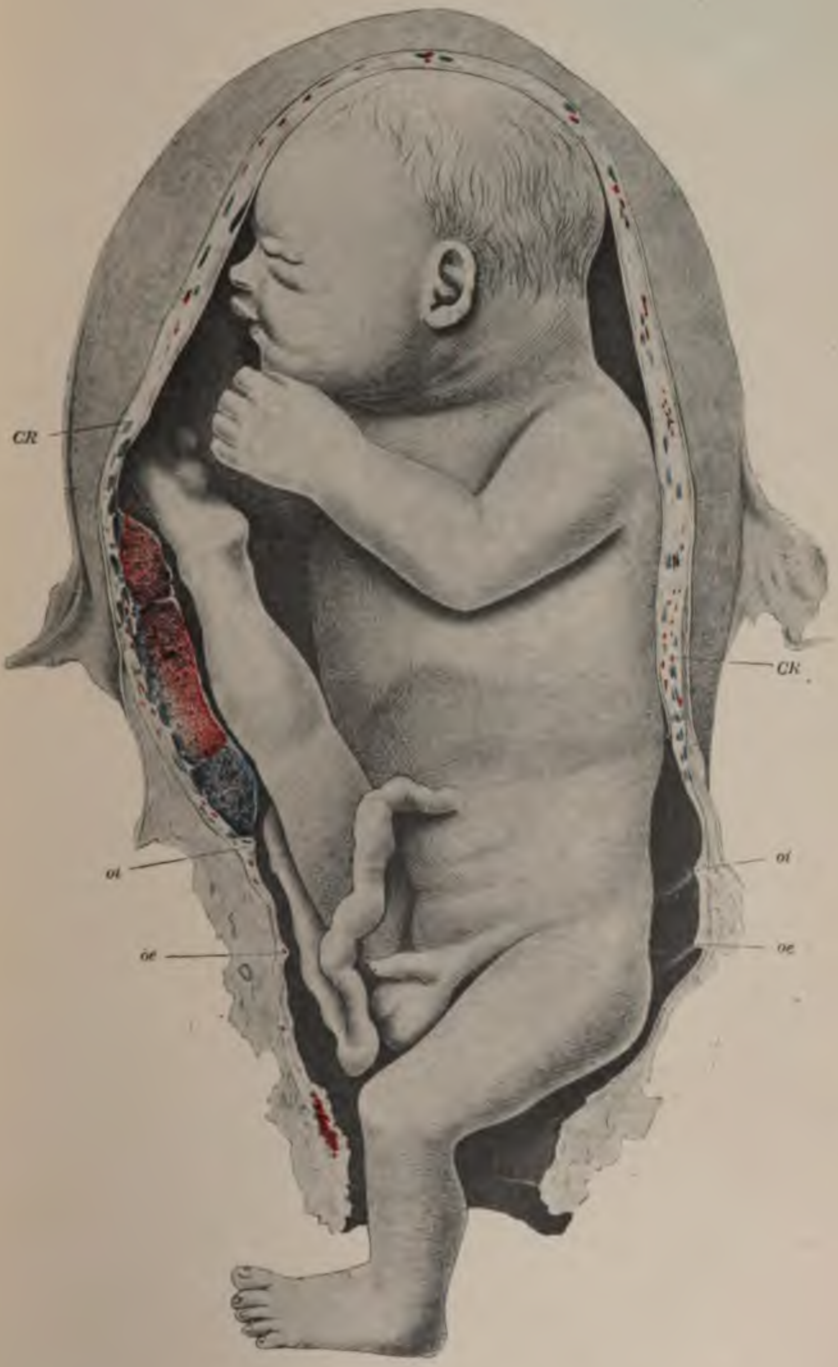
In cases of central placenta prævia the lives of mother and child are in the greatest danger, and delivery should be practised without regard to the child, but with reference to rescuing the mother from her condition of danger.

In cases of central placenta prævia, where the cervix is tightly closed, the mother and child in good condition, delivery by Cæsarean section is justifiable in the hands of a competent operator and assistants. In primiparous patients the length and tightness of the cervix, which justifies delivery by Cæsarean section, are most often observed. In multiparous patients and in those in whom the tissues are softened and relaxed, delivery should be effected by dilatation and extraction through the vagina. It is evident that Cæsarean section will be justifiable in but few cases of placenta prævia, but in these cases, in good hands, it has saved the lives of mother and child.

The General Treatment of Central Placenta Prævia.—Success or failure in central placenta prævia will depend upon the rapidity and skill with which the contents of the uterus are removed. As more or less hemorrhage is inevitable, acute anæmia must be recognized with these patients. The operator's temptation is to proceed as rapidly as possible, forgetting that at one point in the delivery of the patient delay in the interests of the mother is the best course.

When the decision has been made that the case should be delivered without abdominal section, in preparing to extract the fœtus the operator should have sufficient assistants to use anæsthesia safely and also to practise intravenous saline transfusion. The vaginal treatment of placenta prævia is based upon the interests of the mother only, and hence the fœtus is to be used as a plug or tampon, without regard to the continuance of its life. In many cases version by Braxton Hicks' method is the method of choice. When one or two fingers can be introduced through the cervix, a foot or leg of the fœtus may gradually be brought within reach by suprapubic manipulation with the external hand. So soon as the foot or leg can be grasped, it may be brought down into the cervix and the breech be made to descend into the lower uterine segment. Severe hemorrhage must cease when this is accomplished, as the body of the child makes efficient pressure upon the placenta and uterine wall. When so much has been accomplished, it is often the part of wisdom to cease attempts at extraction. A noose of bandage should be slipped over the child's ankle, in order that traction may be made at any time upon the foot without disturbing the placenta. If the mother's condition is serious, intravenous saline transfusion may be practised before she rouses from the anæsthetic. Strychnia and ergot should be given hypodermatically, whiskey and normal salt solution injected into the rectum, external heat supplied, and all measures taken to secure as

PLATE XIX.

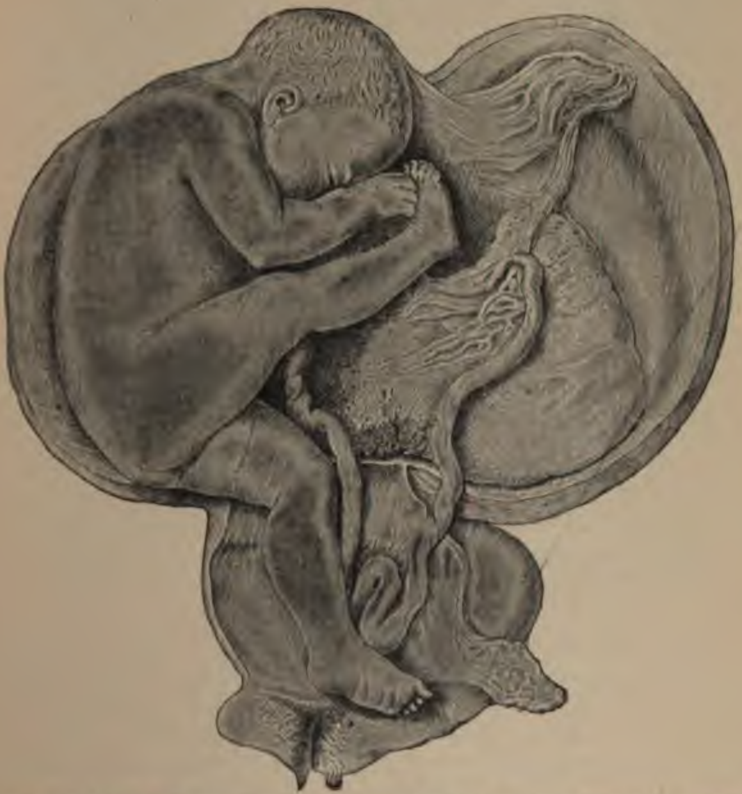


Placenta Prævia. Version. Death before Delivery. (STRATZ.)

CR. Contraction-ring. *oi.* Os internum. *oe.* Os externum.

soon as possible reaction. When this occurs, uterine contractions will begin, the fœtus will be forced into the pelvic cavity, and extraction can then be practised with less shock and danger to the mother. The child in such cases will be lost.

FIG. 56.



Placenta prævia and breech presentation. Placenta in lower uterine segment and internal os. (RUNGE.)

The Treatment of Placenta Prævia Other than Central.—In the other varieties of placenta prævia it is usually possible to bring down the presenting part or one end of the fœtal ovoid, and by this compress the placenta against the wall of the pelvis and check hemorrhage. (Plate XIX.) In cases of partial placenta prævia, where the os and cervix will admit two fingers, version may be made by the procedure of Braxton Hicks. This consists in introducing two fingers of one hand within the cervix and pressing up the head, while the other hand raises the body of the fœtus and head and endeavors to push the trunk downward into the brim of the pelvis. By the combined use of the hands it is possible to turn the child without the introduction of the hand within the uterus.

In performing version with bimanual manipulation, anæsthesia, while not always necessary, should be promptly resorted to whenever the mother is so sensitive that the manipulations of the physician cause voluntary efforts which threaten to defeat his purpose. Chloroform will be found most useful, although, if delivery with forceps is anticipated, ether may be used, the anæsthesia being continued until delivery is accomplished.

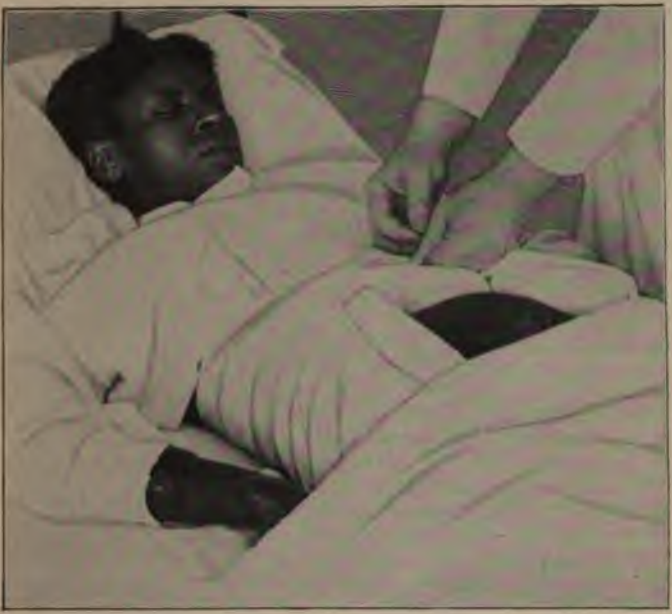
In marginal and lateral placenta prævia it is usually sufficient to rupture the membranes, thereby favoring the descent of the presenting part, which will compress the placenta. The placenta should be removed as soon as the birth of the child has occurred in these cases, because its presence in the lower portion of the uterus may interfere with uterine contraction. As a rule, however, it follows the child as soon as birth occurs. In cases in which the head is presenting, but does not descend promptly after the rupture of the membranes, it should be brought into the pelvis by suprapubic manipulation and labor terminated by the use of the forceps.

Postpartum hemorrhage of varying severity not infrequently follows delivery in cases of placenta prævia. The contraction of the uterus does not suffice in these cases to check the bleeding, because the blood comes from sinuses in the lower uterine segment, which are but little compressed by the contraction of the expulsive portion of the womb. Hemorrhage cannot cease until the placenta has been completely separated, the uterus emptied, and pressure brought to bear upon these sinuses; hence it is necessary for the operator to empty the uterus completely and to apply firm pressure by packing the uterus and the vagina with antiseptic gauze. With these precautions, loss of blood should cease so soon as delivery is completed.

Treatment During Convalescence.—The after-treatment of cases of placenta prævia requires the vigorous use of those agencies which promote rapid formation of blood. The patient must be fed small quantities of easily digested food at short intervals. Especially valuable to patients in this condition are milk peptonized, without greatly heating it, which is much more palatable than when the same preparation is made with the prolonged use of heat; peptonized oysters, freshly made chicken-broth, beef-juice, white of egg and sherry; milk-toast with cream and sprinkled with salt; milk prepared with rennet, and raw eggs beaten up with whiskey or brandy. Milk should not be given unless peptonized, as with many weak patients it is not well digested and accumulates in the stomach, forming a mass of curd, which ultimately brings about vomiting and prostration.

HYPODERMOCLYSIS may be practised with advantage for several days in desperate cases, while the inhalation of oxygen is also of value. Iron and arsenic are useful, and small quantities of alcoholic stimulants are required. As soon as possible massage should be employed, and will be of great value. Such a patient must retain a recumbent position until she is thoroughly well, because of the danger of collapse and fatal syncope following heart-clot upon sudden exertion. To prevent uterine relaxation and bleeding after hemorrhage has ceased, the uterus may be compressed by applying three rolls of towels, one above the fundus, one on each side, kept in place by a binder (see Fig. 57).

FIG. 57.



Application of the box binder to prevent relaxation of the uterus.

In giving a patient who has recovered from labor complicated with placenta prævia tonic remedies, care must be exercised to make a proper choice. Some forms of iron do not agree with these cases, and the mistake is often made of giving too large doses, so that the patient's power of assimilation is overtaxed. If the patient can take it, tincture of the chloride of iron, in doses not exceeding ten drops very well diluted, may be taken three or four times daily. The tartrate of iron and potassium may be used to advantage in capsules in the following combination:

Tartrate of iron and potassium	grs. 60.
Extract of nux vomica	grs. 3.
Scale pepsin	grs 30.

In 30 capsules, one four times daily, with food.

Other preparations of iron which are useful are the citrate of iron and manganese, the peptomanganate of iron, and, in some cases, reduced iron. In using arsenic in these patients, the simplest form of administration is unquestionably the best. Fowler's solution, well diluted, taken just before or after eating, gives best results. If the patient prefers the use of some of the mineral waters containing arsenic, there are a few which are suitable, although they are not readily obtainable in this country. The property possessed by bichloride of mercury to stimulate the formation of blood-corpuscles should be remembered in some patients who recover slowly after bleeding. Bichloride in doses of $\frac{1}{200}$ of a grain may be given two or three times daily at the time when food is taken. It is questionable whether the inhalation of oxygen results in the absorption of the gas itself or whether it brings about rapid breathing, and thus introduces more of the external air than the patient would otherwise take. Some cases are benefited by it, whatever may be the explanation of its method of producing a result.

In general, it may be stated that the success of treatment in placenta prævia depends upon early diagnosis, prompt and efficient manipulation, and thorough antiseptic precaution. Under the use of the antiseptic tampon the dangers of this complication have been overcome and largely reduced. Infant mortality must remain high from this cause, but it is greatly lessened by prompt delivery.

Mortality and Morbidity. FREQUENCY.—The frequency of placenta prævia is variously stated. Strassmann[174] selected from hospital records 130 cases of placenta prævia in 32,960 labors. In 3,085 confinements under his observation, 101 cases of placenta prævia occurred. These statistics show considerable variation, which may be due to difference in classification and definition of placenta prævia. The form of placenta prævia depends upon the location of the ovum within the uterus. Central or total placenta prævia occurs in about 22 per cent. of reported cases, and among these patients 83 per cent. were multiparæ. Placenta prævia recurs in the same individual in the proportion of 7 to 95. It is not infrequent in twin pregnancy, and is often accompanied by polyhydramnios.

Mortality and morbidity of central placenta prævia must inevitably be high. From 20 to 30 per cent. is an average mortality in cases receiving fairly intelligent treatment. In the hands of skillful operators under antiseptic precautions, mortality may be reduced to less than 20 per cent. In other varieties of placenta prævia than central, maternal mortality falls to about 7 per cent.

Fœtal mortality in placenta prævia is highest in central placenta prævia, where more than 90 per cent. of the children are lost, and falls to an average of about 60 per cent. in all varieties.

MORBIDITY.—The hemorrhage caused by placenta prævia, with added risk of septic infection through the necessity for manipulation, gives a maternal morbidity of from 18 to 20 per cent. This must vary greatly in proportion to the skill of the operator and the thoroughness of his antiseptic precautions.

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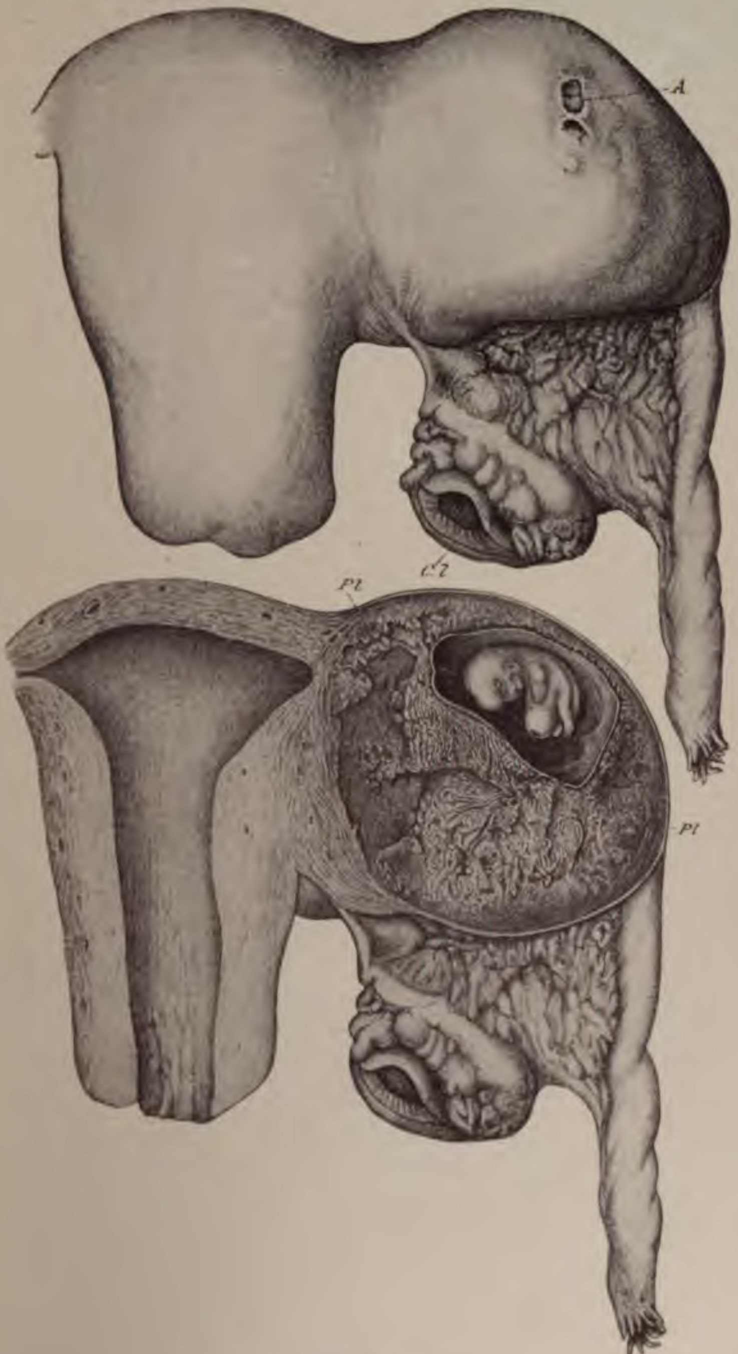
[174] Strassmann: Zeitschrift für G. und G., Bd. 44, Heft 3, 1901.

PLATE XX.



Interstitial Pregnancy.

(LEOPOLD: Archiv. für Gynækologie. Band 58, Heft 3, 1899.)

CHAPTER XXIII.

ECTOPIC GESTATION (EXTRAUTERINE PREGNANCY).

Ectopic gestation or extrauterine pregnancy is that condition of the patient in which the impregnated ovum is contained outside the cavity of the uterus. The location of such an ovum may be within the cornu of an imperfectly developed uterus, within the Fallopian tube, where it passes through the body of the uterus, or in the tube itself. By rupture of the tube the ovum may lodge and grow between the folds of the broad ligament, gradually extending upward behind the peritoneum or within the peritoneal cavity among the intestines.

Etiology.—The cause of an abnormal location of the impregnated ovum is not clearly known. Primigravidæ and multigravidæ are subject to these complications. It has been asserted that it is most common in women who have had inflammation of the lining membrane of the Fallopian tube. This, however, is not clearly established, for there are reasons for believing that inflammation of the lining membrane of the Fallopian tubes would render it impossible for the ovum to lodge in that portion of the genital tract.

Signs and Symptoms.—The signs and symptoms of extrauterine pregnancy are cessation of menstruation, changes in the breasts characteristic of pregnancy, slight enlargement of the uterus, the discharge from the uterus of shreddy mucus, and the progressive growth of a tumor in the pelvic cavity.

The changes in the uterus in these cases differ markedly from those which occur in normal pregnancy. The enlargement of the body of the womb is much less. The cervix remains longer and less soft than in normal cases. The womb does not continue to enlarge in these patients, but remains stationary in size after the third or fourth month.

Varieties.—The most frequent variety of ectopic gestation is that described by the term tubal, in which the impregnated ovum lodges within the Fallopian tube. As growth proceeds, rupture of the tube is inevitable, unless the tube contracts with sufficient vigor to expel the ovum into the abdominal cavity. Such extrusion is known as tubal abortion. After the rupture of the tube, the ovum may retain sufficient vitality to attach itself to intraabdominal tissue, and thus an abdominal pregnancy may result. Ovarian pregnancy has also been observed, the ovum having been impregnated apparently while within the Graffian follicle. Interstitial and cornual pregnancy are occasionally seen. (Plate XX.)

Diagnosis.—To diagnosticate ectopic gestation, the diagnosis of pregnancy must first be made. In many cases signs and symptoms are almost typically present, and the discovery of a tumor near the uterus makes the diagnosis comparatively simple. In other cases the changes in the uterus characteristic of pregnancy are so little advanced that practically no information can be obtained in this way. The breasts may show some of the characteristic changes, and menstruation may not have entirely ceased, but may have been disordered. In other cases a positive diagnosis of ectopic gestation before the abdomen is opened is impossible. Usually evidence of pregnancy accompanied by the presence of a sensitive tumor near the uterus, the womb remaining smaller than the period of pregnancy would naturally suggest, affords good reasons for suspecting ectopic gestation. A diagnostic point of some value is given by Weindler.[175] He has found by the study of his cases that menstruation rarely ceases immediately in ectopic gestation. During the early months menstruation is more than usually prolonged and more frequent than normal. In cases which go as late as the third and fourth month, menstruation may be absent at first, then recurring in a typical or increased manner during the latter portion of the time.

DIFFERENTIAL DIAGNOSIS.—A retroverted pregnant womb containing a blood clot or a beginning polyhydramnois may closely simulate ectopic gestation. By vaginal examination it is impossible to tell whether the blood clot in a softened and dilated uterus may not be a pelvic hæmatoma or ruptured tubal gestation.

A dermoid cyst incarcerated in the pelvis may also lead to a suspicion of ectopic gestation. So may any pelvic tumor which is found near the uterus and which has the consistence of the sac of the embryo or of a hæmatoma. Abortion following intrauterine pregnancy or entopic gestation may arouse a suspicion of ectopic gestation or extrauterine pregnancy. If such a patient complains of severe abdominal pain, holding the abdominal muscles rigidly, it may be impossible to clearly demonstrate the fact that a pelvic tumor is absent.

Pelvic hæmatoma is most frequently the result of ectopic gestation. It is, however, occasionally seen from other causes, and a differential diagnosis cannot be made without abdominal section, followed by the examination of the pelvic organs. Pelvic abscess may resemble in consistence ectopic gestation, but disturbance of temperature and the history of infection should distinguish between them. A fœtus contained within a uterus whose walls are excessively thin may be supposed to be ectopic or extrauterine. Within the writer's observation two cases were sent for operation for ectopic gestation in both of which the fœtus was within the uterus. In each case the uterus, of excessive thinness in an emaciated and highly neurotic patient, was mistaken for the sac of an abdominal pregnancy. Each case went to term, and was normally delivered of a living child.

Natural Course.—The history of a case of extrauterine pregnancy is characteristic and significant. As the ovum continues to grow, usually within the Fallopian tube, the patient complains of inter-

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[175] Weindler: Archiv für Gynäkologie. Bd. 61. Heft 3. 1900.

PLATE XXI.

Fig. 1.

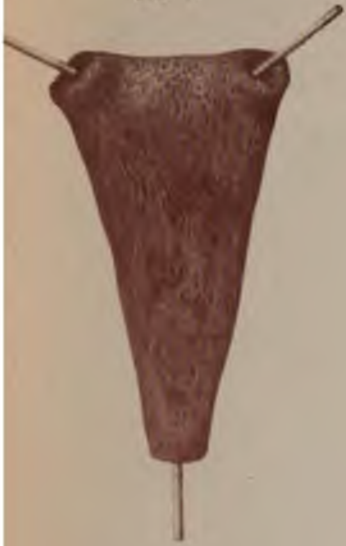


Fig. 2

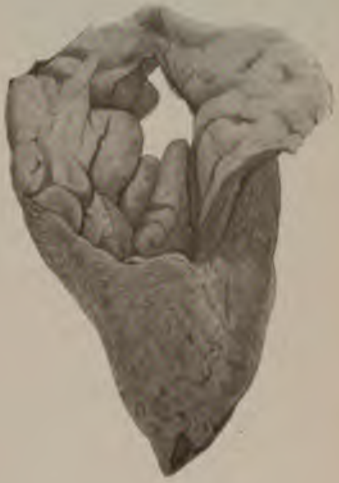


Fig. 3.

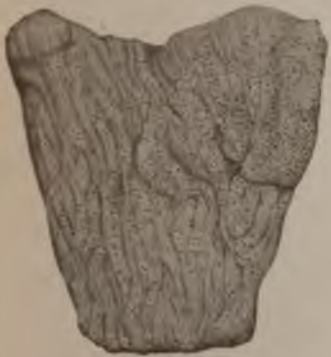
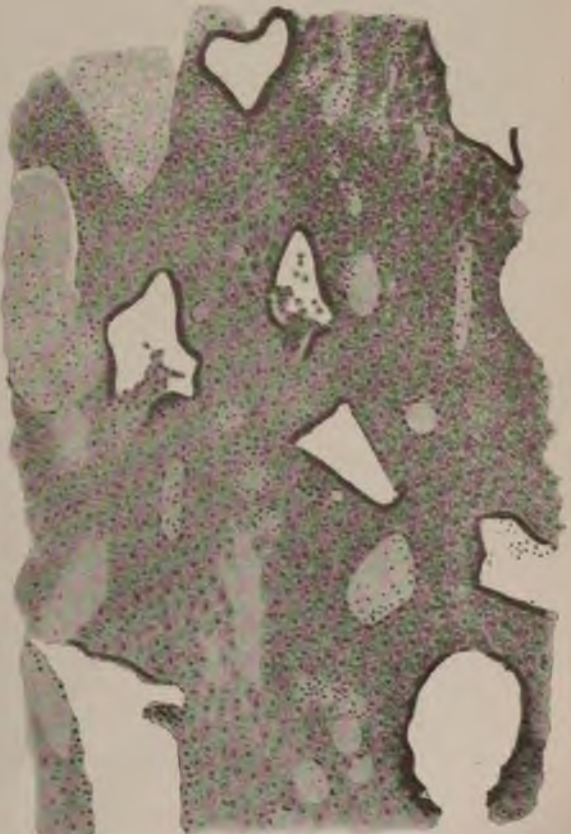


Fig. 4



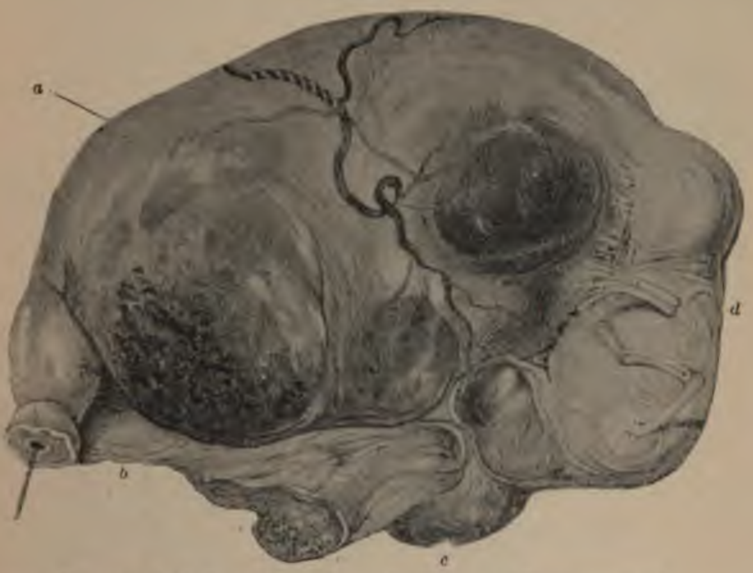
Ectopic Gestation. (Zweifel.)

Figures 1, 2, 3, uterine decidua as expelled from uterus.
Figure 4, characteristic decidual cells.

mittent pain upon one side of the pelvis. This pain is cramp-like in character, and may become severe. At irregular intervals it is followed by the discharge from the uterus of shreds of membrane, sometimes accompanied by blood and mucus. If this membrane be subjected to microscopic examination, decidual cells will be found, less large and perfectly developed than in cases of intrauterine or normal pregnancy. (Plate XXI.)

As the growth of the ovum proceeds, there comes a time when the tissues surrounding the ovum can no longer contain it, and when rupture of this envelope occurs. This is accompanied by sudden and severe pain, with shock and often with hemorrhage from the uterus. The pulse is rapid and feeble, and surgical shock, severe in degree, rapidly develops.

FIG. 58.



Unruptured tubal gestation with apoplectic ovum. (CULLINGWORTH.)
a. Tube distended with clot. *b*. Ovary in section. *c*. Cyst. *d*. Fœtus in sacculus of tube, limbs protruding.

If the ovum has escaped between the folds of the broad ligament, the anterior and posterior layers of the ligament and the peritoneum above form barriers to the flow of blood. The blood clots and hæmatoma develops. Active hemorrhage will gradually cease, and the patient will gradually recover from shock. If, however, the rupture has occurred upward and into the general peritoneal cavity, no barrier exists to check the flow of blood, and the patient will become rapidly and fatally anæmic and die in collapse.

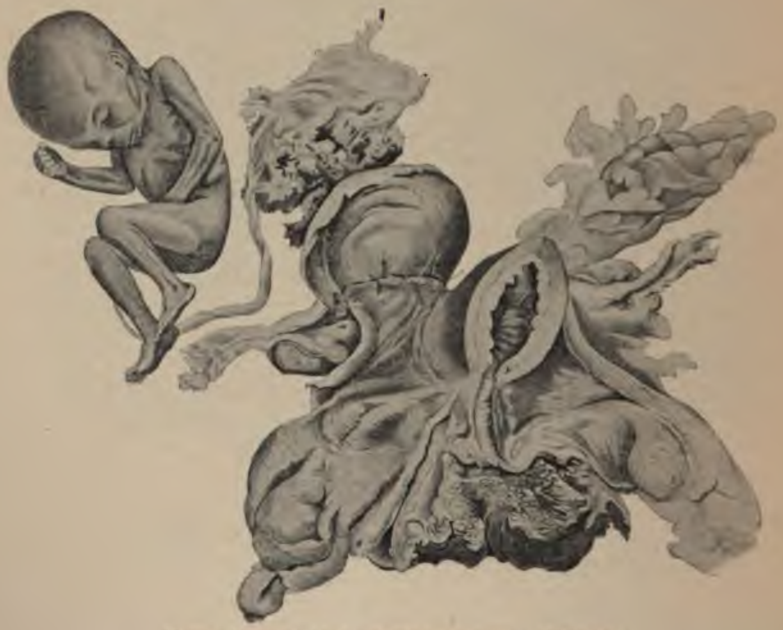
If rupture occurs in such a manner that the ovum escapes beneath the intestine, peritonitis will develop, and bleeding be limited by an exudate. Hemorrhage may gradually cease, and the ovum may continue to develop in this abnormal position.

An ectopic ovum can only develop to term when it becomes so implanted that it finds suitable space and nourishment for its continued growth.

The conditions are not favorable in the pelvic cavity, nor is such growth possible in the wall of the uterus in what is known as interstitial pregnancy. It is only when the ovum develops within the abdomen that the fœtus can go to term.

As extrauterine pregnancy progresses, the signs and symptoms of this condition undergo corresponding changes. As the ovum grows, the pelvic tumor may ascend at one side of the pelvic brim, being perceptible by palpation, while fœtal heart-sounds may be heard by auscultation.

FIG. 59.



Uterus, fœtus and sac, ectopic pregnancy. (WYDER.)

As the fœtus lies closely beneath the abdominal wall in many cases, heart-sounds and fœtal movements may often be perceived more plainly than in normal cases. If the fœtus dies from lack of nourishment, it becomes a foreign body within the mother, and may be expelled by ulceration. Where the fœtus has been in the pelvic cavity, it may be extruded through the rectum, vagina, or bladder. Where the fœtus has perished in the abdominal cavity, it may be expelled through the wall of the abdomen, usually near the umbilicus. If the fœtus comes to term and interference is not practised, it will die through the atrophy of the placenta, and may be retained within her body until the patient's death.

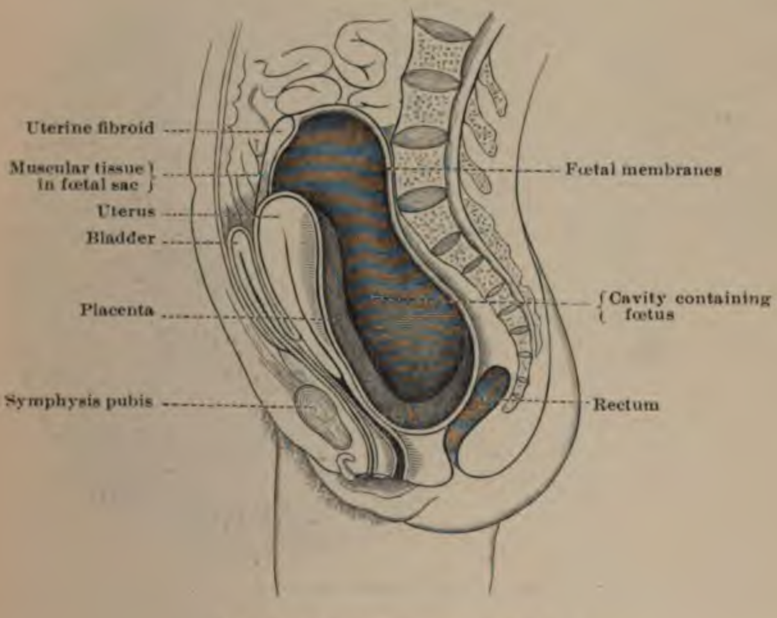
The tissues of the fœtus may be changed by the deposit of earthy material, forming a lithopædion.

In other cases the fœtal tissues become shriveled, and a condition resembling parchment, known as mummification, exists. In other cases the fœtal parts become enlarged and changed to a fatty substance, known as adipocere.

Should the embryo perish and bacteria gain access to its sac, suppuration will occur, followed by septic absorption and ulceration.

Mortality and Morbidity.—It is impossible to accurately estimate the maternal mortality of ectopic gestation for several reasons. Some cases are never diagnosticated, patients becoming ill with symptoms of intraabdominal inflammation, refusing operation, and recovering or dying after long-continued illness. In many cases in which rupture occurs, hemorrhage ceases spontaneously, and slow and tedious recovery ensues. A positive diagnosis of ectopic gestation is often difficult; hence cases may recover or die without recognition. There can be no doubt, however, that the maternal mortality rate of ectopic gestation is a high one. In cases recognized early and subjected to prompt treatment, a mortality of less than 10 per cent. results. In infected cases, where rupture and hemorrhage occur, the mortality rises in direct proportion to the length of time elapsing before the

FIG. 60.



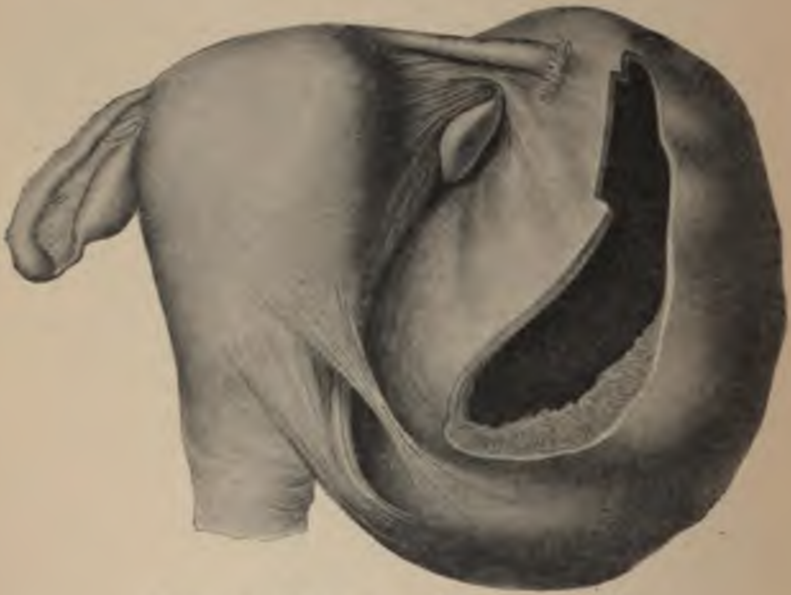
Abdominal gestation-sac. (SUTUGIN.)

patient is brought under medical control and the presence or absence of septic infection. The fœtal mortality of ectopic gestation is almost 100 per cent. Very rarely the child lives sufficiently long in the abdomen of the mother to attain viability. It may then be removed with a chance for its survival.

Treatment.—Experience has shown that but two methods of treatment in ectopic gestation are of value. The first is surgical interference, and the second expectant treatment. The use of electricity, aspiration, or injection of the sac of the embryo are methods which experience condemns.

Under some circumstances the expectant treatment of ectopic gestation is justifiable. When cases come under observation after the hemorrhage has ceased and the hæmatoma has become encapsulated, infection being absent and the patient in good general condition, delay is justifiable. The patient must, however, be kept under close observation, and the surgeon must stand ready to interfere at any time when symptoms of infection develop, or when it becomes evident that hemorrhage is continuing. Champneys[176] reports 75 cases of ectopic gestation, 45.3 per cent. of which were successfully treated without surgical interference. These patients were kept at absolute rest; cold was applied over the abdomen in some of them, care was taken to keep the genital tract from becoming infected, and the

FIG. 61.



Uterus and sac of broad ligament gestation. (ZWEIFEL.)

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[176] Champneys: Journal of Obstetrics of the British Empire, January, 1902.

patient's nutrition was promoted as greatly as possible. The expectant treatment is only justifiable when patients are under close observation, and under conditions where operation may be undertaken should the necessity arise.

In some cases the patient's refusal to submit to operation, or the fact that the surroundings are such that operation cannot be done, forces the physician to adopt the expectant method.

OPERATIVE TREATMENT.—In cases where the ovum is small and is found within the pelvic cavity, the operator has his choice of two avenues for approaching and removing it.

The abdomen may be opened, and the Fallopian tube ligated and removed, with ovum and ovary upon that side; or the vagina may be opened behind the uterus and the ovum, tube, and ovary pulled down, ligated, and removed. The choice of a method of operating will depend upon the size and location of the tumor, and the physician's previous training and experience.

In the presence of rupture of an extrauterine pregnancy, the safest treatment consists in abdominal incision, ligation of the bleeding tube, and its removal with ovary and ovum. It is true, however, that cases sometimes recover by the spontaneous and gradual cessation of bleeding. If the operation is refused by the patient, or if the physician is placed in circumstances where it is impossible to operate, he must delay, watching the patient closely and making needed preparation for the operation as soon as possible.

The patient must be kept absolutely at rest, and her pain, if severe, be controlled by morphine and atropine by hypodermatic injections. There is no drug which will control bleeding in these cases, and the patient's best chance lies in absolute quiet, in the hope that a clot will form and gradually check the hemorrhage. Should this occur, the pulse will improve, the patient's strength slowly return, and she will make a tedious recovery. The effusion of blood in contact with the peritoneum in these cases sets up an adhesive peritonitis, which often assists to check the bleeding. If such a patient be examined a short time after the hemorrhage has ceased, a large, doughy mass will be found within the pelvis. This will gradually be absorbed, if infection does not take place.

In cases of rupture of an extrauterine pregnancy, immediate operation is the safest and best treatment, and the physician should be content with nothing less when operation can be performed.

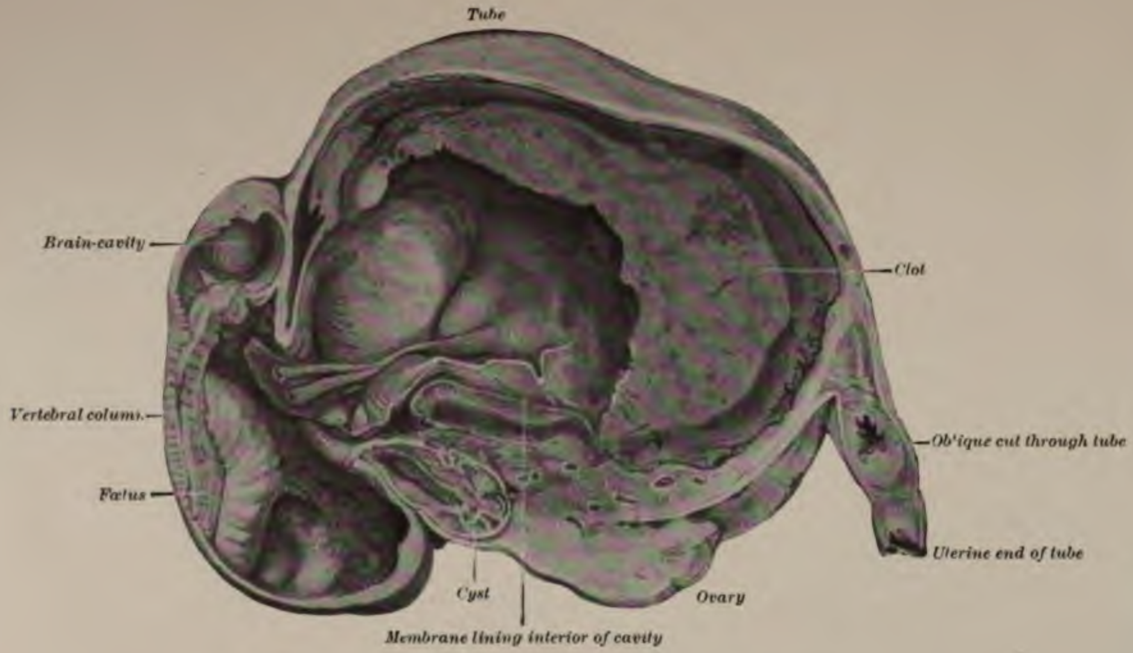
Abdominal Pregnancy.—In cases where the embryo is developed within the abdominal cavity, abdominal incision must be made and the fœtus extracted. Delay has been advised by some to allow the fœtus to die and the placenta to become partially separated, thereby greatly diminishing the risk of bleeding at the time of operation. This, however, is not judicious treatment, as it sacrifices the life of the child and does not avoid considerable risk to the mother. In these cases the pregnancy should be allowed to continue to term; the abdomen is then to be opened over the centre of the tumor.

In cases of abdominal pregnancy several dangers are to be encountered which are not present in ruptured tubal gestation. If the pregnancy has proceeded to the point where the fœtus is of considerable size, the placenta has developed, being firmly attached to the intestine, mesentery, omentum, or wall of the pelvis. The effort to separate the placenta is attended with great risk of fatal hemorrhage. In exceptional cases the placenta may be so attached that the tissues to which it is adherent may be ligated, and thus the placenta removed while hemorrhage is controlled. Such would be the case if its attachment was to the omentum, or mesentery, or to the broad ligament, in such a manner that the tissues of the ligament could be ligated and the whole removed. In most cases, however, it would be necessary for the physician to open the sac at its most dependent and protruding point. When this has been done, the fœtus should be at once extracted and the umbilical cord ligated and cut. The fœtal sac should be emptied of amniotic liquid by sponging, and the fluid should not be allowed, if it can be avoided, to enter the peritoneal cavity. A careful examination should then be made to determine the attachment of the placenta, and whether or not it can be safely removed. If there is doubt upon this point, the cord should be ligated again close to the placenta and cut above the ligature, the membranes should be stitched to the edges of the abdominal incision, and the placenta allowed to remain, while the amniotic sac is tamponed with antiseptic gauze, the end of which emerges at the abdominal incision. In this way pressure prevents serious hemorrhage, the placenta becomes gradually loosened, sometimes piecemeal and sometimes almost entire, while an abdominal sinus is left which will gradually close. If the peritoneal cavity does not become infected, the patient's chance for recovery after this procedure is far from desperate.

In cases where the fœtus is dead or partially decomposed no effort should be made to remove the placenta completely, but only those portions should be taken away which separate spontaneously at the time of operation. The gauze tampon should be employed in these cases, and placenta and membranes allowed to come away gradually with the formation of the fistula. When the fistula is established, irrigation may be practised with the mildest antiseptic fluid, care being taken not to disturb granulating surfaces which would further fresh absorption of septic matter.

In cases of abdominal pregnancy the operator usually opens the fœtal sac at its centre; it may be possible, by making a lateral incision, to enter the sac of the fœtus externally and without opening the peritoneum. The fœtus must be rapidly extracted, the cord tied in two places, and cut between the ligatures. If the placenta separates readily, it may be quickly removed. In the great majority of cases, however, it will be found adherent, and should be allowed to remain. The cord should be ligated again close to the placenta and cut beyond the ligature. The fœtal membranes, if uninjured, should be brought to the edge of the abdominal incision and stitched to the

PLATE XXII.



Unruptured Tubal Gestation, with Apoplexy of Ovum. (Cullingworth.)

abdominal walls. The fœtal sac must be thoroughly tamponed with iodoform gauze, and the gauze allowed to project from the abdominal wound. The placenta will gradually separate, and may be removed by the operator, or it will undergo necrosis without infection or suppuration. The patient's recovery will be slow, and an abdominal sinus and fistula will persist for some time.

The children born from extrauterine pregnancy are seldom of good size or of great vitality. They require especial care and tax the resources of the artificial rearing of children severely.

THE CHOICE OF METHODS OF TREATMENT IN ECTOPIC GESTATION. —In the present state of our knowledge on this subject, we are in the possession of a mass of experience by which methods of treatment must be judged. The endeavor to destroy the fœtus by electricity or by injection has seemed rational and feasible, and has attracted much attention. The results, however, are not sufficiently good to warrant confidence in these procedures. (Plate XXII.)

In cases of abdominal pregnancy the operator should remove the fœtus and appendages entire if possible. The effort, however, to separate the placenta from the abdominal viscera has been disastrous, as fatal hemorrhage usually occurs in these cases.

Where the relationship of the fœtal sac can be traced to the Fallopian tube upon one side, hemorrhage from the sac may be lessened by ligating the ovarian artery of that side. Although the operation seems incomplete when the placenta is allowed to remain, this expedient has greatly reduced the mortality of abdominal pregnancy and must be accepted as a reliable method.

Vaginal section gives excellent results in cases of ectopic gestation in which a pelvic hæmatoma has completely developed. In Champney's series of cases, to which allusion has already been made, vaginal section was done in 20 per cent. without mortality. Immediate abdominal section gave better results than deferred section, the mortality of the former being 22.2 per cent. and of the latter 29.41 per cent. The mortality rate for all cases of abdominal section was the same as the mortality rate for cases treated by the expectant method.

Puncture only should be avoided in these cases. If a hæmatoma is opened, it should be freely evacuated, thoroughly washed out with normal salt solution and drained with antiseptic gauze. Simple puncture is unsafe, unreliable, and gives very unsatisfactory results.

In no condition has modern obstetric surgery gained better results than in extrauterine pregnancy. If early diagnosis be made and the operation be undertaken promptly under thorough antisepsis, the results are usually favorable.

Intrauterine pregnancy and extrauterine gestation may be present at the same time and in the same patient. The ectopic embryo should be removed by operation, and the intrauterine embryo be allowed to develop to term if possible.

CHAPTER XXIV.

MULTIPLE PREGNANCY.

By the term multiple pregnancy is meant the presence in the body of the mother of more than one embryo or fœtus. Usually both are contained within the uterus, although a number of cases are on record in which one fœtus has been within the uterus and the other has been an ectopic pregnancy, outside the womb.

The usual number of embryos in multiple pregnancy is two, but occasionally three, four, and five have been observed. Authentic cases in which six embryos have been found are very rare.

Frequency.—Various authorities state differing frequency for twin pregnancy. Seegert,[177] in Ohlshausen's clinic in Berlin, found recorded 233 twin labors in 15,977 cases, or one in .456 per cent., or one twin birth to 68.6 per cent. labors. Saniter[178] found one case of triplets in 2,349 births. Veit and Vomeckel found one case of triplets in 7,910 births, twins once in 89 labors, and quadruplets one in 371,126 births. Mirabeau collected 30 groups of statistics from different countries, showing the frequency of triplets to be one in 6,558. Quintuplets are so rare that there are few statistics regarding their frequency.

Uniovular and Duovular Twins.—Twins may develop from two separate ova when they are termed duovular, or from one ovum with cleavage of the embryonic area when they are termed uniovular. Duovular twins have two placentæ, either entirely separate or joined only at the edges, with separate circulation. They have separate chorion and amnion, and the sex is unlike. Uniovular twins have one large placenta, two cords, one chorion, two amnions, and are of the same sex. In a portion of the placenta of uniovular twins, the circulation anastomoses. If the circulation of either twin be disturbed, polyhydramnios may develop; twisting of the cord is also more frequent in these cases than in cases of duovular twins. In duovular twins it is not infrequent for one to perish and for the other to be compressed between the wall of the uterus and the membranes of the living child. Under these conditions, the dead fœtus becomes flattened, and is known as fœtus papyraceus.

Conditions which Tend to Produce Multiple Pregnancy.—The tendency to multiple pregnancy is hereditary. In twin pregnancy the mother is usually between the ages of twenty-five and twenty-nine. For triplets, the greatest number of cases is observed between the ages of thirty and thirty-four.

Superfœcundation, or the simultaneous impregnation of more than one ovum, is a recognized mode of development of multiple pregnancy. Superfœtation, or successive impregnation at short intervals, may also be recognized as possible before the envelopes of the ovum have closed the uterine cavity. Of these, the former is undoubtedly the more common. It is observed that in periods of famine, or in countries where excessive poverty occurs, multiple pregnancy is less frequent than under circumstances of plenty.

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[177] Seegert: Zeitschrift für Geburtshülfe und Gynäkologie, Band 49, Heft 2, 1903.

[178] Saniter: Zeitschrift für Geburtshülfe und Gynäkologie, Band 46, Heft 3, 1901.

Diagnosis.—The diagnosis of multiple pregnancy is made by observing the natural size and contour of the abdomen and its contents. Upon palpation, an unusually large, solid mass is found within the womb, and in some cases two heads and one breech may be recognized or two breeches and one head. It is rare that more than two children can be distinctly outlined by palpation. If polyhydramnios exists, palpation is rendered much more difficult, and it may be impossible to clearly outline even one of the fœtuses.

The distinct recognition of two fœtal heart-sounds is of great value in determining multiple pregnancy. To obtain this, the patient must rest comfortably upon her back in a perfectly quiet room. The observer must go over the abdomen carefully with a stethoscope, studying the various sounds and outlining areas of greatest intensity. Care must be taken to distinguish areas of reflected heart-sound from those in which the sounds are sufficiently distinct to be recognized as positive. A large uterine area, giving a very loud souffle, calls attention to one large placenta or two placentæ joined at the borders. Two distinct areas of loud placental souffle indicate two placentæ.

Ahlfeld's method of measurement may also be employed. If the distance between the lowest presenting part at the pelvic brim and that fœtal extremity which is furthest from the pelvic brim be taken, and if this distance be found to be more than 30 cm., twin or multiple pregnancy may be inferred. In polyhydramnios Kielmann has found that fluctuation is distinctly conveyed to the bag of waters within the cervix, while in twin pregnancy this phenomenon is lacking. Prolapse of the cord, with unruptured membranes, is also a diagnostic sign of multiple pregnancy. The possibility of accurate diagnosis may be inferred from Seegert's statement, that in 233 cases a positive diagnosis was made before labor in 101.

Twin Pregnancy.—The most common form of multiple pregnancy is that of twins. The relative proportion of uniovular to duovular is estimated by Ahlfeld as 16.9 per cent. of uniovular to 83.2 per cent. of duovular.[179] In 46 per cent. both children were found by Seegert in vertex presentation, usually with the back of one child to the left side and that of the other turned toward the right. In 34 per cent. one child was in vertex and one in breech presentation. In 8 per cent. one child presented by the vertex and one in transverse presentation, and in 4 per cent. one child presented by the breech and the other was transversely.

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[179] Ahlfeld: Zeitschrift für Geburtshülfe und Gynäkologie, Bd.47, Heft 2, 1902.

The greater number of twins are of the same sex, one-third being of different sexes. Male children predominate among twins. The greater majority of twins are born about the eighth month of gestation, but a small percentage go to the full termination of pregnancy. Two factors seem to bring about this result—one is the overdistended condition of the uterus and the other the increased tax upon the excretion of the mother. The combined weight of twins is usually greater than that of average single pregnancy. Each twin, however, is less than the average fœtus in single pregnancy. A considerable variation between twins in size must be ascribed to a difference in the placental area from which each twin is nourished: thus, the twin having the larger placental area will become the greater.

Labor in Twin Pregnancy.—The first stage of labor in twin pregnancy is often prolonged, and uterine contractions are not efficient. This naturally arises in cases where the uterus is greatly distended. When dilatation is complete and the membranes rupture, the first child is usually born without difficulty. If there are separate amnions, a pause will occur after the birth of the first child before the membranes of the second rupture. When this takes place, the second twin not infrequently presents in some abnormal manner. Transverse presentation, with prolapse of the arm, is not unusual; abnormal rotation of the vertex or presentation of the breech may be observed.

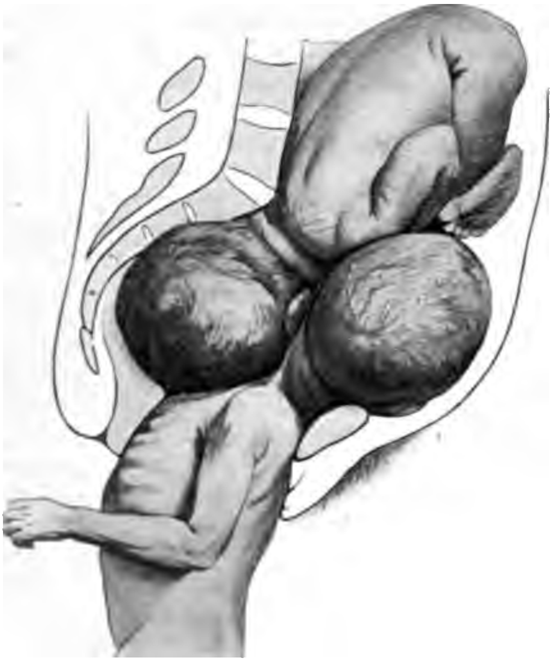
The placenta rarely follows immediately upon the birth of twins. Its large area requires more than the average time for separation, while the strength of the uterus is not such as to induce vigorous contractions. Should the placenta partially separate, hemorrhage will occur, and may be severe, because of the large placenta and the comparatively weak uterine contractions. When polyhydramnios is present, labor may be very slow in becoming fully established, and the uterus may empty itself rapidly when finally it is roused to action.

Complications of Twin Pregnancy and Labor.—Twin pregnancy predisposes to polyhydramnios, toxæmia, and eclampsia, nephritis, œdema, and placenta prævia. At labor the mother's risk of hemorrhage is much greater than the average, while dangerous syncope or fatal shock is sometimes seen in these cases. Twins may become impacted during labor, the occiput of one pressing beneath the chin of the other, and labor may become impossible. The unusual presentation of the second twin often makes interference necessary and exposes the mother to unusual danger from this source; hence, twin pregnancy increases considerably maternal mortality and morbidity. Seegert found that polyhydramnios was present in 6 per cent., hemorrhage in 11.16 per cent., and eclampsia in 12.88 per cent. of twin pregnancy.

For the children, complications arise from interlocking, whereby the life of one or both may be lost. Prolapse of the cord, eclampsia, unfavorable presentations of the second twin, and rapid extraction increase the fœtal mortality in these cases. In polyhydramnios one or both twins may suffer from dropsy and feeble development.

Retention of the Second Twin.—In some cases a considerable interval elapses between the birth of the first and second twin. This may happen in duovular twins, where the ova have attached themselves to different areas of the uterus. The long retention of the second twin is usually accompanied with distinct risk to the mother. It is only in exceptional cases that it is followed by good results.

FIG. 62.

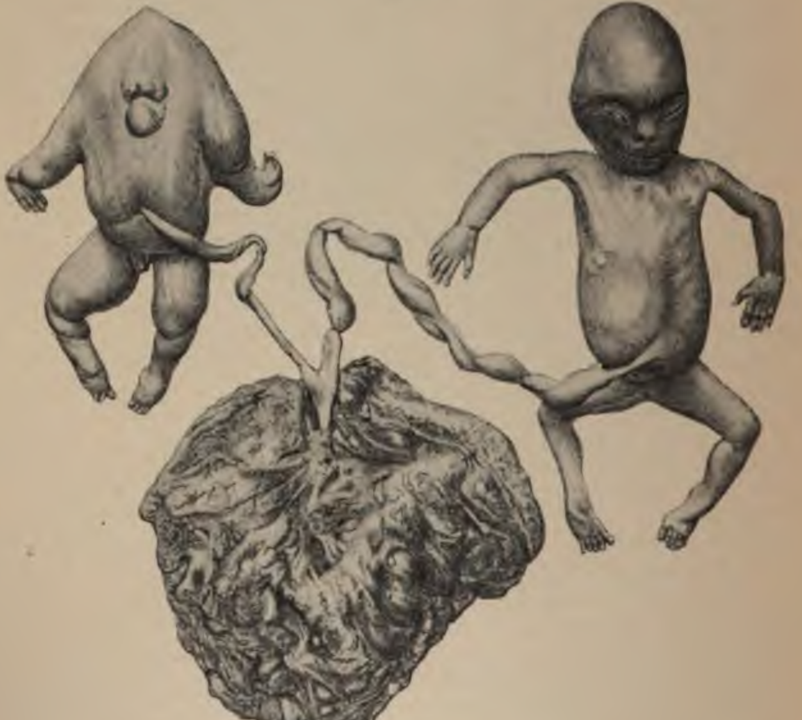


Locked twins. (BUMM.)

Treatment of Twin Pregnancy and Labor.— During twin pregnancy the mother demands unusual care. Constriction with clothing should be entirely abandoned. The excretions must be stimulated, nutrition promoted, and undue exertion avoided. The diet, while abundantly nutritious, must be adapted to the increased tax upon elimination. The patient must be watched for symptoms of toxæmia, and this condition must receive prompt and thorough treatment.

Premature labor must be anticipated in these cases, hence the patient and her nurse should be in readiness, and arrangements should be so made that the children, if under size and frail, may receive proper care. When labor occurs, the physician must be careful to detect prolapse of the cord or premature rupture of the membranes. Should dilation be slow and labor pains harassing and inefficient, an elastic bag may be inserted within the uterus. When the first child is born, the physician must be prepared to ligate its cord carefully and be ready to proceed at once to the extraction of the second twin. The results of prompt delivery for the second twin are considerably better for mother and child than a waiting policy. If the membranes of the second child do not promptly rupture, they should be broken and the child extracted by forceps or version. Good assistance is needed during twin labor, that the mother's uterus may be carefully watched for symptoms of relaxation and that the children should receive prompt attention. So soon as the children are delivered, the operator must give especial attention to the prevention of hemorrhage. If the uterus contracts well, he may wait a reasonable time for the expulsion of the placenta. Strychnia and ergot may be given hypodermatically with advantage so soon as the children have been expelled. Should hemorrhage begin and the uterus not empty itself, the antiseptic hand, or the hand covered by a sterile glove, must be carried into the uterus, the placenta gently but thoroughly separated, and removed with the membranes and cords. The uterus

FIG. 63.



Twins, one of whom has acardiacus. (SCHATZ: Archiv für Gynækologie, Band 58, Heft 1, 1899.)

should then be douched with lysol, 1 per cent., at a temperature of 110° F., and if the womb does not promptly contract and hemorrhage cease, it should be tamponed with 10 per cent. iodoform gauze. Strychnia and ergot should be given in tonic doses, as the occasion demands. Unless the uterus remains firmly contracted, this packing may be left forty-eight hours and then removed. It is well to irrigate the uterus with 1 per cent. lysol after the packing is removed, but no further douches should be given.

In some cases severe and even fatal syncope follows the birth of twins. Hemorrhage may have been insignificant, and the phenomenon most resembles that seen in cases where a large abdominal tumor is removed. The removal of a considerable mass from the abdomen, which has previously exerted pressure upon the nerves and blood-vessels of the abdomen, is followed by rapid dilatation of the abdominal veins, blood is withdrawn from the nervous centres, and syncope and shock may rapidly develop. When this occurs after twin labor, a large, firm pad should be placed at the epigastrium, and the abdomen should be smoothly and firmly bandaged. The patient should be placed in practically the Trendelenburg posture, with the head greatly lower than the pelvis, and, if necessary, intravenous saline transfusion should be practised. The application of external heat, the use of atropin, and the injection of ether or camphor, salt solution, and whiskey by rectum, gentle massage from the extremities toward the trunk, and the inhalation of oxygen are all of value. Under the prompt hypodermatic use of strychnia and digitalis, many of these patients rally. To secure rest after recovery, small doses of morphia may be necessary.

It is rare for the mother to sustain in twin labor severe laceration. Should injury occur and the mother remain in good condition, laceration should be immediately repaired.

Twin children, if premature and ill-developed, require especial care. Incubation, the avoidance of disturbance, the use of stimulants, and selected feeding are all indicated. If the mother can nurse them, twins often do quite as well as larger children.

Convalescence.—Convalescence from twin labor is longer than from labor with one fœtus. Involution often proceeds more slowly than usual, and care and patience are necessary to enable the mother to fully recover. If infection does not occur and the children nurse, convalescence is more complete than if these essential factors are lacking.

Operations in Twin Pregnancy.—In 41.6 per cent. of Seegert's cases twin labor was terminated by some obstetrical operation. In more than one-half the forceps was used. Next in frequency was extraction, and next version and extraction. In cases of locked twins, if the children are living, a cautious effort may be made, with the mother completely anæsthetized, to completely introduce the hand or fingers and unlock the impaction and deliver the children. Usually one or both children soon die from this complication. Embryotomy should then be performed in the manner best adapted to avoid risk to the mother. In a case of locked twins, in the experience of the writer, both children having died, one child presented by the breech, while the heads remained locked above the pelvic brim. The neck of the first twin was severed, its body removed, the remaining head pushed up into the uterus, the second twin delivered, and then the severed head. These cases must receive such treatment as the circumstances and conditions suggest.

The induction of labor is indicated in twin pregnancy complicated by rapidly increasing polyhydramnios. So slight is the chance of saving the children and so ill-developed are they in most of these cases that no hesitation should be felt in relieving the mother. It is sufficient to rupture the membranes, allowing a part of the amniotic liquid to escape, and maintaining firm pressure upon the abdomen by a many-tailed bandage. The uterus will soon after empty itself, when the usual precautions must be taken to avoid relaxation and hemorrhage.

Triplets.—Triplets occur most frequently in mothers who have borne twins. Pregnancy is usually continued in these cases to the second half of the eighth month. Saniter found that more than one-half of triplets were viable at birth. During pregnancy the mothers suffer from distention of the abdomen, and there is increased risk of toxæmia, eclampsia, and nephritis. Labor with triplets varies greatly in its duration, in accordance with the strength of the uterine muscle. The second of triplets may be retained for some time within the uterus, but the third is always promptly born. More than one-half present by the vertex, and a very small proportion transversely or obliquely. Most frequently one child presents by the head, the other two by the breech. By ordinary methods a diagnosis of triplets can rarely be made. The use of the X-ray is indicated in these cases, by which a complete diagnosis should be made. Triplets may be developed from one, two, or three ova, and may have separate amnions, one chorion, and one placenta. Acardius has been observed in triplets, and also in quadruplets.

Treatment of Labor with Triplets.—In conducting labor with triplets, interference is usually necessary for the birth of the second and third children. The tendency to relaxation, hemorrhage, and syncope is greater than with twins, and precautions must be taken accordingly. Under good care, the majority of cases do well, a maternal mortality of less than 2 per cent. being reported.

Pregnancy with Quintuplets.—While these cases are rare, an interesting account is given of labor with quintuplets by Sato,[180] of Japan. The mother was a multipara, who married at fifteen and had borne a number of children. There was an heredity of multiple conception in her father's family. Labor took place about the eighth month. During pregnancy she suffered from excessive size and dropsy of the lower extremities. The patient had supernumerary nipples. Labor proceeded spontaneously during the birth of four children. On examination, the head of the fifth was found above the umbilicus, and by gentle pressure the child was brought down and delivered. The placenta for the first and second children was expelled after the birth of the third child. The placenta for the third and fourth children was expelled after the birth of the fourth child. The fifth child had its own placenta. The fourth child was delivered by the feet, the others by the head. Moderate hemorrhage occurred, which ceased on tamponing and compressing the uterus. The placentæ and children were all small. The children were perfectly formed, but ill-developed, and did not long survice.

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[180] Sato: Sei-I-Kwai, Vol. 21, No. 3, 1902.

The Differential Diagnosis of Multiple Pregnancy and Other Intra-abdominal Conditions.—Twin pregnancy is not infrequently mistaken for uterine fibromata. This error happens during early pregnancy, before fœtal movements and heart-sounds can be clearly detected. In cases of polydramnios with twin pregnancy, the presence of a cystic tumor together with a uterine tumor may be diagnosticated. In complicated cases examination under ether is justifiable, when an exact diagnosis can usually be made.

PART II.

LABOR. THE BIRTH-CANAL. THE FŒTUS AT TERM.

LABOR.

By labor we mean the expulsion from the mother's body of her fœtus and its appendages, and by normal labor we mean the birth of the living child without injury to mother and child, and without assistance.

Cause.—The exciting cause of labor is unknown. Although an average length is observed in pregnancy, yet cases differ not only by days, but sometimes by weeks in the duration of gestation, although in these cases no cause in mother or child can be found for such difference. The best illustration which can be used to describe the causes of labor is that of a ripened fruit which falls from the parent tree. This simile has been employed for centuries among the Germans, who speak of the fœtus as the fruit and call the fœtus at term the ripe fruit. The fruit, when grown, may be said to be thoroughly ripe when it no longer depends upon or needs for future life that which produced it. This is true of the human fœtus, for the most rational explanation of the ending of pregnancy asserts as its cause such development of the fœtus that its vital processes may be carried on independently of the mother.

It is also true that the fœtus furnishes a considerable amount of waste material, which is discharged into the mother's blood. The accumulation of this material serves as an irritant to the mother's nervous system, stimulating uterine contraction. Certain circumstances are favorable for the occurrence of labor. Such are any actions on the part of the mother which set up uterine contraction. Any cause which excites the nervous system may bring about the occurrence of labor. At a time of great public calamity abortion and premature labor often occur. Direct violence may also cause labor to begin. Those conditions which are favorable to the postponement of labor are a perfectly regular life without interruption, freedom from anxiety and hard work, abundant food, and an absence of active exertion. In such conditions labor may be delayed two, three, or four weeks beyond the usual termination of pregnancy.

Varieties.—By spontaneous labor we understand the expulsion of the fœtus and its appendages from the body of the mother by her own essentially unaided efforts. This is usually considered by those who treat of the subject as normal labor.

A premature labor is one which occurs before the full term of gestation. As the fœtus becomes viable at twenty-six weeks, and as pregnancy may go to forty weeks, premature labor is not uncommon.

The phrase "delayed labor" expresses an unusually long parturition. In primiparous patients labor rarely lasts more than twenty-four hours, and in multiparous patients from eight to twelve hours. If parturition be much prolonged, the labor is delayed.

A difficult labor is one attended with especial delay or suffering or risk to mother and child, while an impossible labor is one in which parturition by the mother's unaided efforts ceases and interference becomes an imperative necessity. An instrumental labor is one which is terminated by the use of instruments, the phrase being one of popular and loose meaning.

It is sometimes necessary to interrupt pregnancy in the interests of the mother or child, or both, and when this interruption is done after the fœtus is viable, the labor is said to be induced. The rapid extraction of the child by abdominal incision can scarcely be termed an induced labor, but must be considered a radical interruption of pregnancy. A pregnant patient sometimes goes long beyond the usual term of gestation. Signs and symptoms of labor may appear but cease, and in such a case the labor is said to have been missed.

Course and Stages.—Labor is commonly divided into three stages. The first of these, of indefinite duration, begins when the child enters the brim of the pelvis and gradually engages. Days, or even weeks, may be occupied by this process. In the latter portion of the first stage the uterine birth-canal dilates, while the contraction of the uterine muscles is accompanied by the extrusion of the membranes, filled with amniotic liquid. The cervix is first shortened and finally obliterated, and the os dilated. The presenting part engages in the upper pelvis, and may descend into the pelvic cavity. Uterine contractions become regular and of considerable strength. The membranes rupture, and some of the amniotic liquid escapes. During this stage of labor the lower uterine segment is more or less distended, and by its elastic resistance increases flexion in head presentations, keeps the presenting part closely applied to the pelvic brim, and thus facilitates its descent.

In normal labor, when dilatation is complete, the membranes rupture, and that portion of the amniotic liquid which has accumulated between the presenting part and the membranes escapes. Uterine contractions increase. The presenting part of the child descends to the floor of the pelvis and rotates, and is finally expelled over the pelvic floor and through the vagina. The body of the child follows gradually. The second stage may be termed the expulsive stage of labor. It terminates with the escape of the child. The third stage of labor comprises the expulsion of the placenta, cord, membranes, and that portion of the amniotic liquid which did not escape when the membranes ruptured.

THE BIRTH-CANAL OF THE PARTURIENT WOMAN.

While the minute anatomy of the birth-canal engages the attention of the anatomist, the obstetrician is especially interested in that portion of the body of the living parturient patient.

The Pelvis.—We have already given, in treating of the diagnosis of advanced pregnancy, the external dimensions of the pelvis, which are readily obtained by examination during pregnancy. To understand the mechanism of labor, it is important to recall the internal measurements of the bony pelvis.

A better understanding of labor is obtained by comparing the internal measurements of the bony birth-canal with those of the head of the fœtus. The internal antero-posterior diameter of the pelvic brim measures 11 cm. (4 to 4½ inches). The transverse diameter is, in the living patient, 11¾ to 12 cm. (4½ to 4¾ inches). The obliques are the largest diameters of the pelvic brim, 13 cm. (5 inches). It is evident that a normal head can enter the brim of a normal pelvis by bringing any diameter but its maximum (13½ cm.) to present to one of the oblique diameters of the pelvic brim. This accounts very largely for the oblique position of the head in the beginning of normal labor. The average diameter of the cavity of the bony pelvis is 12½ cm. (4¾ inches). The head, when flexed, can rotate freely in a normal pelvis, as it presents in flexion with its suboccipito-bregmatic diameter (9 cm., 3¾ inches).

The antero-posterior (pubo-coccygeal) diameter of the pelvic outlet is 9 cm. (3¾ inches), which is enlarged by the backward movement of the coccyx to 13 cm. (5 inches). The transverse diameter of the pelvic outlet (between the tuberosities of the ischia) is an unchangeable measurement, 10 + cm. (4 + inches). At the outlet delivery is possible when flexion is present by the backward movement of the coccyx.

Axis of the Pelvis.—The bony pelvis of the mother is so placed in the skeleton that its axis describes a curve extending from a point midway between the promontory of the sacrum and the pubes to a point midway between the tip of the coccyx and the under surface of the pubes. This line may be demonstrated to be a mathematical curve, which, for purposes of anatomical study, is of interest and value. The inclination of the pelvis may be estimated by studying the planes of its inlet and outlet and their relation to the perpendicular line of the body.

Barbour[181] describes the inclination of the brim of the pelvis by referring to a perpendicular from the upper margin of the symphysis on a line passing through the promontory of the sacrum in the direction of the long axis of the abdomen. He finds that the angle of divergence of the plane of the brim from this perpendicular is the same as the angle of divergence of the axis of the brim through the long axis of the abdomen. The more nearly the plane of the brim approaches this line the more does the long axis of the abdomen come into line with the pelvic inlet. The average angle obtained in this way is 55°. While it is difficult to obtain this accurately in the living subject, its study calls our attention to the fact that in the study of parturition we must consider not the inclination of the brim in the upright posture of the patient, but when the patient is in the dorsal position or upon the side, as is usual during labor. Clinical observation shows that the inclination of the pelvis to the axis of the trunk differs greatly with posture, and that it is well to refer this inclination to some fixed line within the body of the patient. Calderini, Klein, Mercurio, Walcher, and others have shown that the true conjugate of the pelvis does not remain the same, and that not only the inclination of the pelvis but also its capacity may vary greatly in different positions of the patient.

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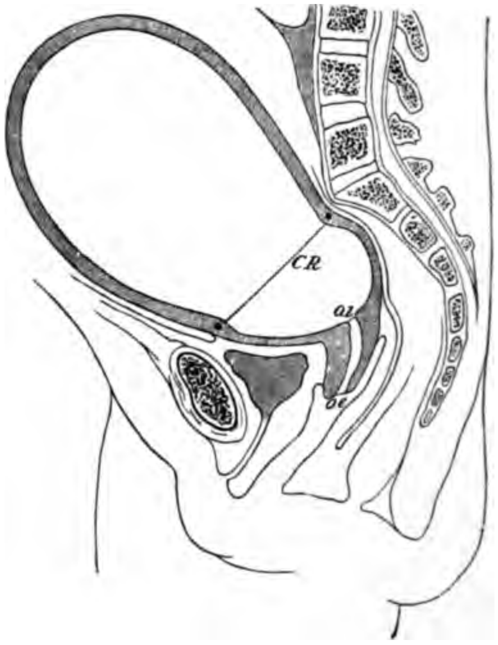
[181] Barbou: British Medical Journal, June 23, 1900.

FIG. 64.



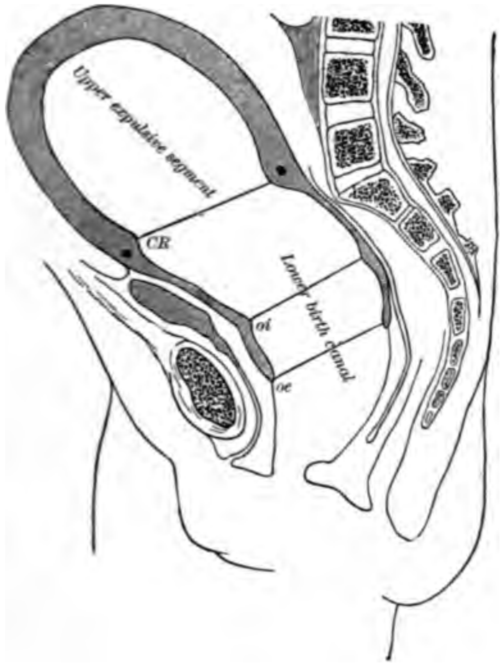
CR. Contraction-ring. *oi.* Internal os. *oe.* External os. (SCHROEDER.)

The Uterus: The Expulsive Segment.—At the termination of pregnancy the well-developed uterus measures from fourteen to twenty inches in length, and weighs from one and one-half to two pounds. It is composed of three distinct portions, each of which has a separate function in parturition. The relative size of these portions may be represented by dividing the length of the uterus into six parts, when the upper or contractile segment will contain relatively four of the six, the lower uterine or distensile segment will contain one of the six parts, and the cervix the remaining portion. The functions of these three portions of the uterus are to expel the fœtus until it

reaches the floor of the pelvis, to maintain its position of flexion, and to form a continuous birth-canal from the uterus to the vagina.

The upper expulsive portion of the uterus comprises two-thirds of its extent, and is composed of interlacing muscular fibres, which are arranged in three directions, namely, in a circular manner, in a longitudinal, and in an interlacing arrangement. If a recently emptied uterus be cut through, the thickness of the uterine wall at its thickest portion will be found to be from three-quarters to one inch. Between the muscular fibres the mouths of bloodvessels can be seen as large as the ulnar artery. The uterine muscle is firm in texture and closely covered with its peritoneal coat, and lined with the deciduous membrane. At the upper and outer portions of this part of the womb the muscle is seen to be arranged in circles around the orifices of the Fallopian tubes. If an attempt is made to dissect the individual fibres of the uterine muscle, the undertaking is one of great difficulty, because of the interlacement of the fibres. **The shape of the uterus at term is ovoidal, the broader end of the ovoid being above and the smaller end below. The upper portion of the womb at labor extends to a broad hand's-breadth above the umbilicus, crowding the intestine up against the diaphragm.** The uterus lies obliquely in the

FIG. 65.



The uterus distended during birth. (SCHROEDER.)
Lower birth-canal is composed of the lower uterine segment (from *CR* to *oi*), and the cervix (from *oi* to *oe*).

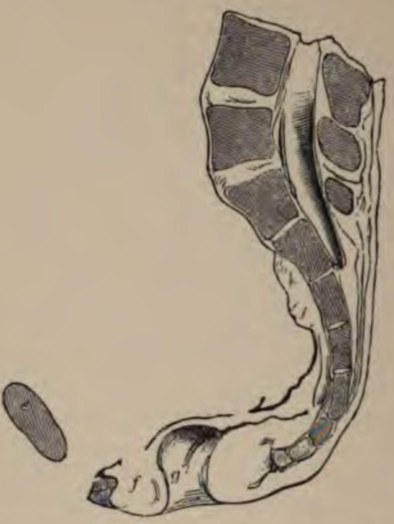
The *Cervix* [illegible] of the womb is the [illegible] The length of this portion of the uterus does not vary essentially during pregnancy or labor. In primigravidæ the external os remains small, but partially opened until the dilatation of the upper portion of the cervix is complete. In multigravidæ, however, the external os remains partially opened, its lips are everted and somewhat fissured, while the greater resistance to dilatation is experienced at the internal os. The cervix is composed essentially of fibrous tissue, the development of muscular fibre occurring at the internal os in sufficient degree to form a sphincter of the uterus. This muscular tissue is not present in considerable amount, but forms the termination of the muscular fibres of the upper and lower segments.

Cervix during Labor.—As the cervix is the portion of the uterus accessible to examination during labor, its contour and direction are of practical interest to the physician. In primiparæ, as the head descends, the lower uterine segment and the internal os become first dilated, the external os and cervix are directed downward and backward into the hollow of the sacrum. This renders the external os less accessible to the finger of the examiner, and may occasion difficulty in diagnosticating the stage of labor. Remembering this, the physician, in making an examination, will endeavor to carry the finger backward, and if difficulty is experienced through the resistance of the perineum he will do well to turn the patient upon her side, when the pelvic floor can be readily drawn backward and no difficulty will be experienced in finding the os and cervix. In cases where the external os is very small and the tissues about it are resisting the cervix may become so greatly thinned as to give to the finger the feeling of the head covered by the membranes. The cervix has been punctured in the effort to rupture the membranes in such a case. If the finger be passed about the external os in a primipara during labor, a firm, tense edge can sometimes be felt, which dilates very slowly. This is the margin of the fascia and connective tissue of the cervix, and is sometimes so resisting as to require division.

The cervix is lined with its mucous membrane, and not with decidua. The placenta is never attached to the cervix proper, but always to the lower uterine segment, in placenta prævia, just above the cervix. This fact has an important practical bearing in dealing with cases of placenta prævia by the use of the tampon and by dilatation.

The Vagina.—The uterus terminates in the cervix upon the pelvic floor and in the vagina. The attachment of the uterus to the vagina is by fibrous and elastic tissue, which is capable of considerable distention during the process of birth. The position of the uterus is such that the line of direction taken by the fœtus in passing out of the uterus is a line downward and backward. This distends the posterior wall of the vagina, drawing it gradually up over the head as the fœtus is expelled. The anterior wall of the vagina is compressed, during labor, beneath the pubes and subjected to less strain than is the posterior. The curve of the pelvis and the distention of the posterior vaginal wall are such that rupture of the vagina from the uterus occurs most frequently along the posterior wall in the hollow of the pelvis, in Douglas' cul-de-sac.

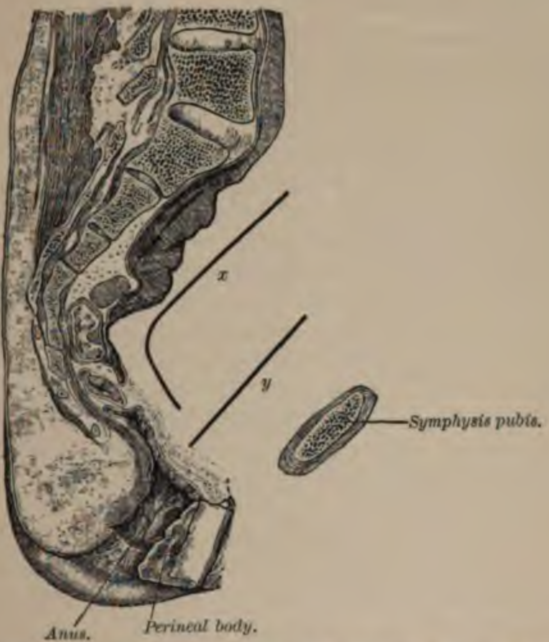
FIG. 66.



The sacral or supporting segment *f g* of the pelvic floor and posterior vaginal wall in sagittal mesial section. The pubic or displaceable segment, uterus, and posterior vaginal wall have been removed. *e.* Symphysis pubis. *f.* Perineal body. *g.* Anus. (HART.)

The Pelvic Floor.—The pelvic floor is a muscular diaphragm, pierced by the openings of the rectum, the vagina, and the urethra, and composed of two segments, which together form the levator ani muscle with its fascia. Dissection has shown that the pelvic floor is composed of three portions of interlacing muscle and fascia, attached to the coccyx and sacrum, to the ischium, and to the pubes. These muscles contract in a direction upward and slightly backward, thus tending to support the uterus, bladder, and rectum, which are above them. At the occurrence of labor the pelvic floor is functionally divided into two segments, of which the posterior is the larger and the more important. This comprises the muscle and fascia attached to the sacrum and coccyx and to the sides of the ischia, and interlacing in the pelvic floor to form the tissue commonly called the perineum. As far as labor is concerned, the posterior segment of the pelvic floor embraces the posterior wall of the vagina, and the tissues between it and the sacrum and coccyx. The function of this segment of the pelvic floor during labor is, by the retrocession of the coccyx, to dilate downward and backward, thus opening the orifice of the vulva and permitting the extrusion of the fœtus. This action is sometimes impeded if the sphincter of the vagina be tight and resisting, and this complication is demonstrated when the sphincter is incised and the posterior segment of the pelvic floor at once drops downward and backward.

FIG. 67.



Sagittal mesial section of pelvis to show sacral segment. (HART.)
x and y. Lengths of paths described by fœtal parts lying posteriorly and anteriorly in pelvis.

The anterior segment of the pelvic floor embraces the anterior wall of the vagina and the fascia and connective tissue which support the urethra and the neck of the bladder. This segment is without active function in labor, except that it is drawn upward and inward, and is usually tightly compressed during the passage of the child beneath the pubes.

Muscular Tissue of the Birth-Canal.—The soft tissues of the birth-canal at labor form a continuous muscular and membranous tube of between two and three feet in length. This tube is composed at its highest point of the dense muscular tissue of the uterus, which gradually becomes thin and blended with the elastic tissue until the pelvic floor is reached, when strong muscle and fascia are present. The axis of the uterus in labor is the line of direction taken by the fœtus in passing out of the womb. When uterine contractions occur, the round ligaments of the uterus contract and bring the upper segment forward so that its axis coincides with that of the pelvic brim. This tends to force the child downward and backward through the bony pelvis. When this is accomplished, the fœtus meets the resistance of the pelvic floor, and the muscular tissues of its two segments contract, at the same time relaxing its elastic fibres and alternating its muscular contraction with relaxation. The action of the birth-canal is essentially that of peristalsis, namely, muscular contraction, followed by the distention of elastic tissue and alternating with periods of muscular repose. As the fœtus advances, the longitudinal, muscular, and elastic fibres of the uterus draw the tissues upward over the fœtus, thereby increasing the distention of the portion of the birth-canal remaining below and aggregating the muscular fibre of the uterus which is above, and which is forcing the fœtus downward.

When the child reaches the pelvic floor, the lower sacral segment moves strongly upward and backward, while the anterior segment draws upward and inward and is compressed beneath the pubes.

Blood-Supply of the Uterus.—The anatomy of the blood-supply of the uterus during labor is of practical importance to the physician, in view of the control of hemorrhage arising either through uterine relaxation or by reason of traumatism. The blood-supply of the uterus from the ovarian and uterine arteries enters at such a point that, when the uterus is emptied at labor, these arteries are brought within the bony cavity of the pelvis and are subjected to the pressure of the pelvic walls. The result of this is seen in the gradual cessation of bleeding through diminution in the arterial supply of the womb. The contraction of the muscular fibres of the uterus closes the wide-mouthed sinuses which are seen in its wall. Not only is this so, but the arteries so enter the womb that the position of marked anteflexion of the recently emptied uterus serves to assist greatly in compressing the uterine arteries at the sides of the cervix. It is evident that the bloodvessels of the uterus are not readily exposed to traumatism during labor. It very rarely happens that rupture of the womb tears either the uterine or ovarian arteries. The cervical artery is often wounded in cases of severe laceration of the cervix, where the rent extends into the vaginal junction, opening the circular cervical artery. For purposes of operation, the anterior wall of the uterus offers a surface free from large vessels and capable of ready closure by means of suture. Where it is necessary to remove the uterus or to amputate it, the situation of its vessels is such that the operator can usually gain access to them with but little difficulty.

The Dynamic Pelvis.—As pregnancy advances the joints of the pelvis become mobile, synovial secretion is increased, and in some cases the two halves of the pelvis move so freely that the motion is very perceptible at the symphysis pubis, much to the discomfort of the patient. The younger the patient the greater the mobility of the pelvis during pregnancy. Observation has shown that the sacroiliac joints, while exceedingly strong, still permit sufficient motion to enable the two halves of the pelvis to rotate downward and outward upon the sacrum as a base. Mercurio and Walcher have shown that if a patient be placed upon the sacrum at the edge of a table, sufficiently high to allow the lower extremities to hang freely without touching the floor, the weight of the lower extremities causes the two halves of the pelvis to rotate downward and outward, increasing the antero-posterior diameter of the pelvis to an appreciable degree. This increase varies with the age of the patient and with the laxity or firmness of her tissues. If the patient's lower extremities are flexed and lifted upward, the two halves of the pelvis rotate upward and backward, and if the lower extremities are widely separated slight external rotation is also possible. While the alteration in the capacity of the pelvis thus obtained is but slight, it is sufficient to be of much value in cases of difficult labor.

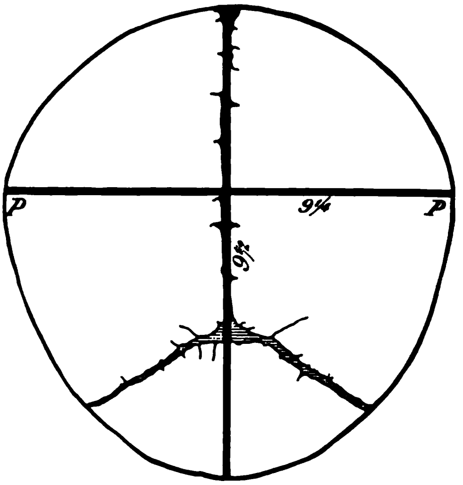
Practical Deductions from the Anatomy of the Birth-Canal.—While the axis of the uterus is downward and backward, and its force is largely expended in bringing the fœtus through the bony pelvis, the child emerges from the mother's body through the combined forces of the resisting power of the pelvic floor and the contractile force of the abdominal muscles. The force of the pelvic floor is sufficiently strong to cause the presenting part to move upward and forward, and thus emerge through the vulva. The line of direction then taken by the fœtus during its birth is at first downward and backward, and then upward and forward. This is the working axis of the birth-canal; this is the line of force which the operator must imitate in all artificial delivery. Failure to understand the anatomy of the birth-canal of the living patient will result in improper efforts to aid labor. The application of this knowledge is seen practically when we assist the passage of the fœtus through the pelvis by manipulation, by pressing downward and backward upon the fundus of the uterus, and by placing the hands upon the presenting part and carrying it downward and backward through the pelvic brim. In expressing the placenta we bring the fundus of the uterus forward and exert pressure downward and backward. In promoting uterine contraction during labor, or to check hemorrhage, we bring the uterus into the line of the birth-canal and exert our pressure downward and backward. Our knowledge of the anatomy of the bloodvessels enables us to compress them against the sides of the pelvis, and thus to lessen arterial flow. In performing version we make traction downward and backward until the pelvic floor is reached by the head. In the high application of forceps we proceed in a similar manner.

In promoting the distention of the pelvic floor during delivery we take care to keep the head well up beneath the pubes and to further the contraction and relaxation of the posterior segment of the pelvic floor, which carry its tissues upward and backward over the head. Remembering this action of the posterior segment, we avoid interfering with it in efforts to prevent laceration. In delivering the child with forceps, when the head is upon the pelvic floor, we endeavor to imitate the mechanism of labor by keeping the head well up beneath the pubes, and by alternately extending and relaxing the pelvic floor. While the minute anatomy of the birth-canal is a matter which cannot readily be carried in mind by the practising physician, a practical knowledge of its structure and function is absolutely essential for the safe practise of obstetric art.

THE FŒTUS AT TERM.

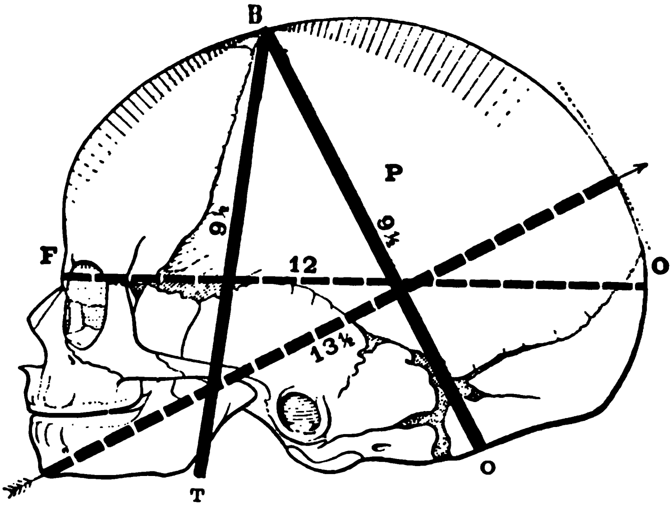
The Fœtal Head.—As the head of the fœtus most frequently presents, its size, in comparison with that of the mother's birth-canal, becomes a matter of much practical interest. The diameters of the fœtal cranium are as follows: Occipito-frontal, from the occiput to the root of the nose or bottom of the frontal bone, 12 cm. (4¾

Fig. 68.



The length and breadth of the fœtal head. *pp*. Biparietal diameter.

Fig. 69.

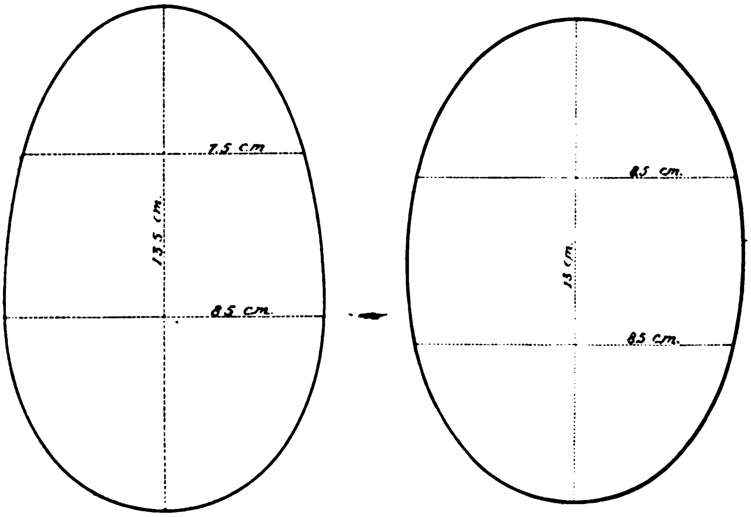


The dimensions of the fœtal head. (Farabeuf and Varnier.)

OF. Occipito-frontal diameter. OB. Suboccipito bregmatic. BT. Trachelo-bregmatic. The minimum diameter is indicated by the long-dotted arrow. Measurements are in centimeters.

inches); occipito-mental, from the occiput to the point of the chin, 13 cm. (5 inches); maximum or greatest diameter from a point midway between the anterior fontanelle and the occiput to the point of the chin, 13½ cm., or 5⅙ inches. Remembering that the antero-posterior diameter of the pelvic brim is 11 cm., or 4¼ inches, it is evident that the child's head cannot enter the pelvic brim with its antero-posterior diameter in relation with that of the brim. The greatest width of the fœtal head is measured between the parietal eminences, and is 9¼ cm., or 3⅞ inches. The greatest depth of the fœtal head is measured by the suboccipito-bregmatic diameter from a point beneath the occiput to the anterior fontanelle. This is 9½ cm., or $3\frac{9}{10}$ inches. The length of the vertex of the fœtal cranium from the top of the occipital bone to the top of the frontal bone is 9½ cm.,

FIG. 70.



Tracing of fœtal head with lead wire immediately after delivery, showing configuration of pelvis.

or practically the same as the suboccipito bregmatic. Recalling the fact that the average diameter of the cavity of the bony pelvis is 12½ cm., or 4¾ inches, it is evident that for the head to pass through the pelvis it must be so turned that the suboccipito-bregmatic and biparietal diameters are brought in relation with the oblique diameters of the pelvic brim and with the pelvic cavity. We shall see later that this is accomplished by flexion or extension. The trachelobregmatic diameter of the fœtal head is measured from the anterior fontanelle downward to the floor of the mouth or anterior border of the foramen magnum. It measures 9½ cm., or 3⅞ inches. The bitemporal diameter of the fœtal cranium or the distance through the temples is less than 9 cm., and not sufficiently large to occasion difficulty. The circumference of the cranium in the average well-formed child is 37 cm. The bisacromial and bistrochanteric diameters of the child's body are seldom so large as to be important factors in labor. Excessive development of the shoulders may produce a bisacromial diameter of more than 13 cm., which, under some conditions in a normal pelvis, may produce dystocia.

The length of the full-term fœtus is 50 cm., or 20 inches, and its weight varies from 6½ to 7½ and 8 pounds.

PLATE XXIII.

Fig. 1.

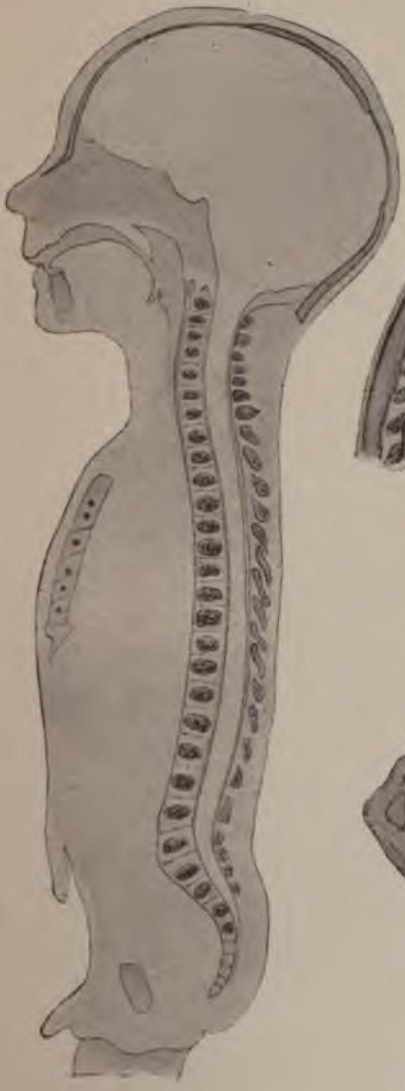


Fig. 2.

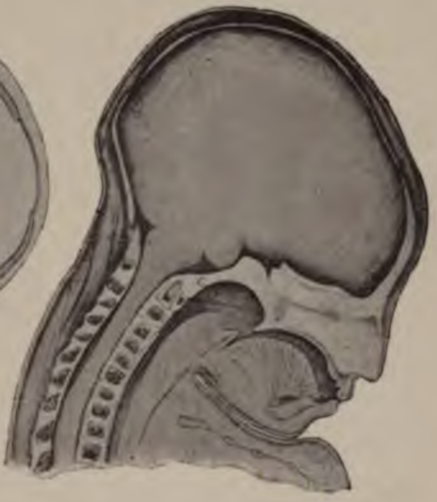
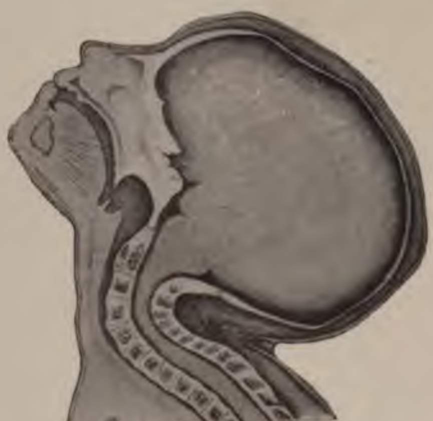


Fig. 3.



Head and Spinal Column of Fœtus, in Flexion and Extension. (Kaltenbach.)

SECTION I.

SPONTANEOUS NORMAL LABOR.

By spontaneous normal labor we understand parturition in which the vertex of the child's head presents, and in which the child and its appendages are expelled from the body of the mother without assistance.

CHAPTER I.

THE MECHANISM OF SPONTANEOUS NORMAL LABOR.

By the mechanism of labor we understand the adaptation of the child to the birth-canal, and the way in which it passes through to leave the body of the mother. The expulsion of the placenta is conducted in a certain manner, and this, too, may be said to have its mechanism.

Adaptation of the Fœtus to the Birth-Canal: **Flexion.**—For spontaneous labor to be possible, the fœtus must so adapt itself to the birth-canal of the mother that it will occupy the least possible space, and thus that its progress will occasion the least difficulty. This is obtained by the development in the fœtus as it grows of flexion. By flexion, or infolding of the fœtus, we mean the bending forward of the head upon the trunk, the compression of the folded lower extremities against the abdomen, the forward bending of the trunk of the child, and the folding and compression of the arms of the child upon the thorax. The attitude of the fœtus is of universal and complete flexion. The result of flexion is to substitute smaller for larger diameters of the fœtal head in relation with those of the mother's pelvis. The diameters of the trunk, which flexion brings into relation with those of the mother's pelvis, are also smaller than those which would be brought into relation if flexion were not present. Flexion early in labor is greatly promoted by a normal condition of the lower uterine segment, which, as labor begins, by its constant elastic force, flexes the head. (Plate XXIII.)

Position.—The fœtal body occupies a definite relation to the body of the mother. Usually the body of the child lies with its long axis parallel to that of the mother's body. Very rarely the long axis of the child's body is transverse to that of the mother. In cases where the long axis of the child's body is parallel to that of the mother, we distinguish two positions of the fœtus, the first and the second. When the back of the child is directed toward the left side of the mother's uterus and abdomen, the position is said to be the first. When the back of the child is directed toward the right side of the mother's uterus and abdomen, the position is said to be the second. When the child is turned transversely, it is called a transverse position.

Presentation.—Some portion of the fœtus is lowest at the pelvic brim when labor begins, and presents to the finger of the examiner. Most usually the vertex of the cranium presents, and hence vertex presentations are by far the most frequent. Less often the face of the child presents. In some cases the breech or shoulder of the child is the presenting part.

Nomenclature.—Spontaneous labor in vertex presentation, face presentation, or breech presentation may occur with first or second position. When transverse position with shoulder presentation is present spontaneous labor is usually impossible.

In describing labor, we usually speak first of the position as first or second, then of the presentation. Thus the most usual form of spontaneous labor is first position, vertex presentation. Next in frequency is second position, vertex presentation. First position, breech presentation; second position, breech presentation; first position, face presentation, and second position, face presentation, are less common.

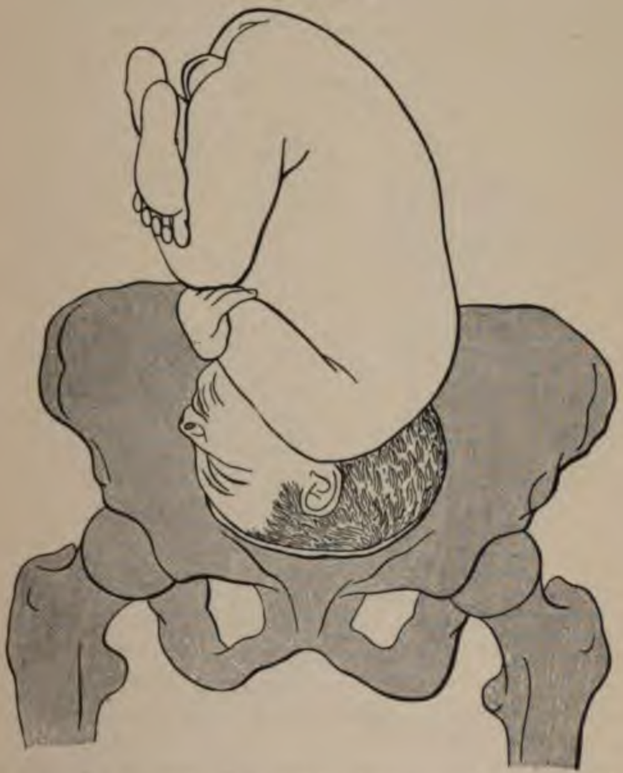
Symptoms.—The symptoms and signs of approaching labor are the gradual sinking of the child into the pelvis of the mother, which produces irritation of the bladder and rectum and irregular uterine contractions, often causing considerable pain. The growing smaller of the abdomen, which is noticeable by reason of the greater looseness of the patient's clothing, a slight swelling of the legs and feet, restlessness, and derangement of sleep, and often a vaginal discharge of whitish mucus are also present.

If an examination of the abdomen be made by palpation, the child will be found with the presenting part within the brim of the pelvis. The movements of the fœtus may be felt to be active, and intermittent uterine contractions can be detected during palpation. By internal examination in primigravidæ the external os will be found but little open, the presenting part within the pelvic brim; the cervix soft and its canal anointed with increased secretion. It may be possible through the distended lower uterine segment to feel sutures and fontanelles. In multigravidæ it may be possible to pass the finger within the uterus and to outline the presenting part and diagnosticate the position.

At the beginning of normal labor the head has entered the brim of the pelvis, its vertex to the left of the median line and in front of a line drawn transversely through the pelvis between the spines of the ischia. The back of the child is directed toward the mother's left side, the bisacromial diameter of its trunk being about to engage in the left oblique diameter of the pelvic brim. Such are the position and presentation of the fœtus when active labor begins in normal cases. The gradual fitting of the fœtus into the pelvis goes on for days and weeks [illegible] its active expulsion begins. It might be reasonable to include this process under the term of labor, but use restricts the term to the actual expulsion of the child.

The subjective signs of labor result from uterine contractions. The pain is often ill-defined in the lower portion of the abdomen, and may be at first ascribed to indigestion. As the greater part of births occur during the night, the patient very commonly blames some indigestible article of food eaten during the past day. The pains, however, become periodic and gradually spread to the back, to the region known commonly as the "small of the back." These pains become stronger at regular intervals, apparently arising from the back and extending around to the pubic region. Examination at this period may fail to discover dilatation of the os or may find the os partially dilated and the cervix partially effaced.

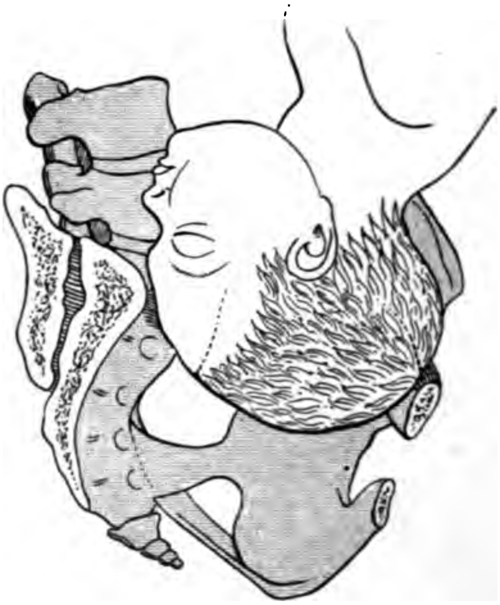
FIG. 71.



First position, vertex presentation before rotation has begun. (FARABOEUF and VARNIER.)

The Development of Active Labor: **The First Stage.**—A discharge which becomes tinged with blood occurs as soon as the cervix begins to dilate. This is commonly called "the show," and is usually regarded as a sign that actual labor has begun. The amount of mucus which is poured out in the genital canal as labor proceeds is sometimes indicative of the normal progress of labor. In cases where this secretion is absent the course of labor may be retarded very considerably. The progress of labor at this stage may be noted by observing that the pains become more severe, the intervals between them shorter, while the patient soon gives evidence of a desire to adopt a posture that shall best favor the descent of the child through the pelvis. It will be found at this stage of labor that patients naturally bend forward, often leaning the upper portion of the body against the back of a chair or some object which gives support to the arms. The patient will instinctively flex the thighs upon the body, thus relaxing the muscles at the brim of the pelvis. The symptoms of the first stage of labor already described become more, and more pronounced until the second stage has begun by the bursting of the membranes. In primigravidæ examination will disclose the gradual disappearance of the cervix, the continued descent of the presenting part, and the gradual protrusion of the membranes and amniotic liquid in the progressive dilatation of the external os. In normal cases the membranes remain unbroken until dilatation is complete and the head has descended through the greater portion of the pelvic cavity. In multigravidæ, the period of dilatation is commonly shorter. The external os is first dilated and then the internal; while the membranes, if the internal os is readily opened, may descend to the pelvic floor and often protrude from the vagina.

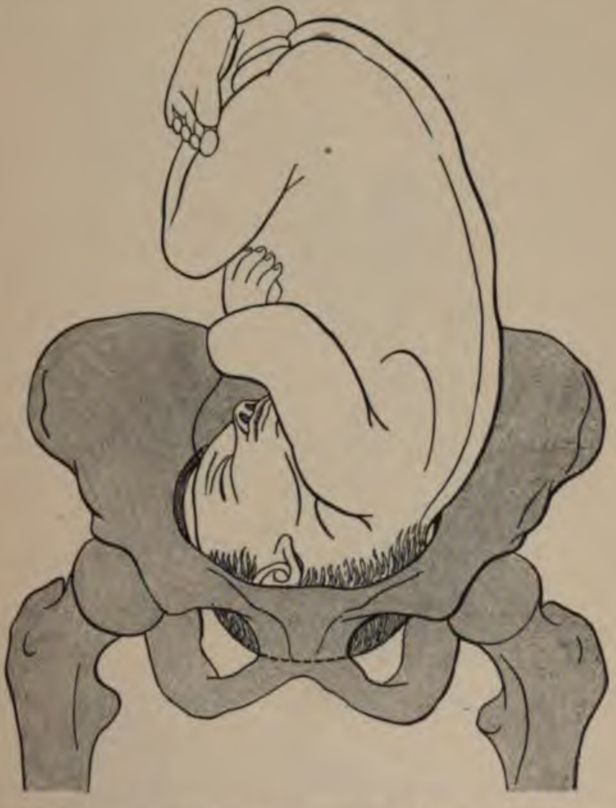
FIG. 72.



The engagement of the head in normal labor. (FARABOEUF and VARNIER.)

The Second Stage.—The second stage of normal labor is characterized by active uterine contractions, which are supplemented by contraction of the abdominal muscles, often aided by voluntary efforts of the patient. The intervals between the pains become shorter until from three to five minutes elapse between each pain. The complaint of suffering is often less than in the first stage of labor, because the patient feels impelled to make strong, voluntary efforts, and hence is less occupied with her suffering. Patients rarely remain in any but a recumbent posture, lying in bed upon the left or right side and occasionally kneeling upon the floor by the side of the bed or partially sitting and reclining in a large chair at the bedside. The shape of the abdomen changes during the second stage of labor, as the round ligaments draw the upper portion of the uterus upward and forward, thus causing a protrusion in the abdomen. Occasionally great irritation of the bladder and rectum is induced at the second stage of labor.

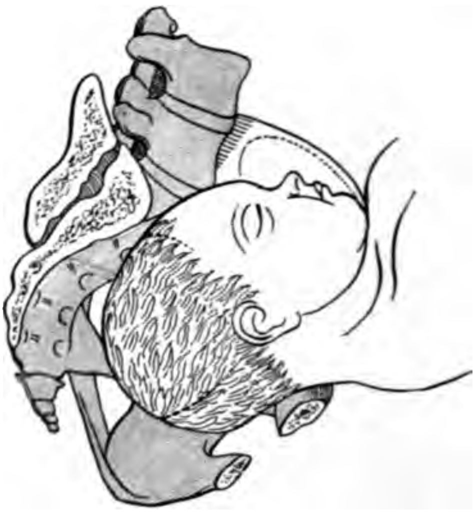
FIG. 73.



The fœtus during the second stage of normal labor. (FARABOEUF and VARNIER.)

Examination of the abdomen during the second stage of labor will find by palpation that the head of the fœtus is descending through the pelvis and gradually passes beyond the reach of the hands of the physician. In palpation the back of the fœtus is at first oblique in the abdomen, the right shoulder being directed toward the right side of the mother and the trunk of the fœtus gradually entering the pelvis as labor proceeds. When the head reaches the pelvic floor and rotates the shoulders continue to descend, rotating partially, so that the back of the child, by palpation, seems often to have rotated within the pelvic cavity. Upon vaginal examination during the second stage of labor the vertex will be found directed toward the left side of the mother's pelvis, just in front of the median line. The smaller fontanelle cannot be felt as space between the bones, because the bones of the skull are pressed together by uterine contractions, thus obliterating the smaller fontanelle. There can be felt, however, the meeting-place of three bony ridges or lines. One of these is the sagittal suture and the others are the sutures between the occipital and parietal bones. It is generally possible to locate this point upon the vertex during the second stage of labor. It is often comparatively easy to find the anterior fontanelle. By beginning at the posterior fontanelle with the examining finger and passing it along the sagittal suture the finger reaches gradually the anterior fontanelle. The two fontanelles and the sutures enable the physician to diagnosticate the position of the fœtal head with reference to the pelvic cavity. It is sometimes impossible to reach the anterior fontanelle by reason of a rigid perineum or because of extreme flexion of the head, which naturally carries the larger fontanelle higher than usual. It is quite sufficient for purposes of diagnosis to recognize the smaller fontanelle and the sagittal suture.

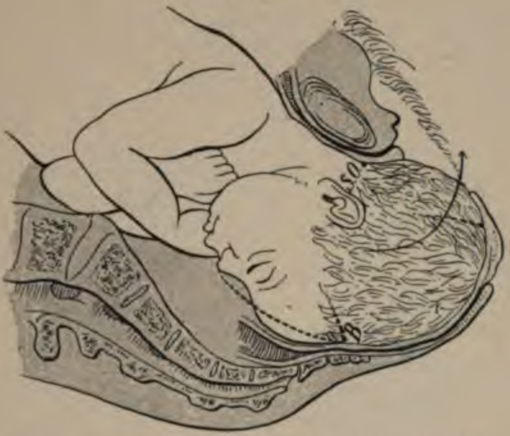
FIG. 74.



The descent of the head in normal labor. (FARABOEUF and VARNIER.)

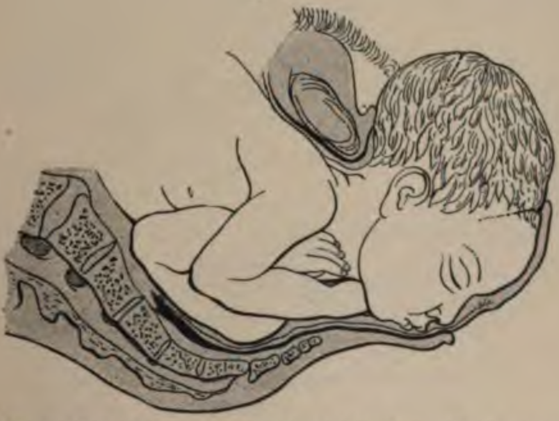
Descent and Rotation.—As the second stage of labor proceeds examination will reveal the fact that the head is descending through the pelvic cavity. If the examining finger be carried around the sides of the head, it is often possible to find the parietal eminences. If the finger be turned against the sides of the pelvis, the spines of the ischia may be recognized. It is a clinical observation of practical value that when the head has passed with its parietal eminences the level of the spines of the ischia it has demonstrated the possibility of its normal exit from the pelvic cavity.

Fig. 75.



The cranium distending the pelvic floor. (Farabœuf and Varnier.)
B. Anterior fontanelle. *SO.* Suboccipital region.

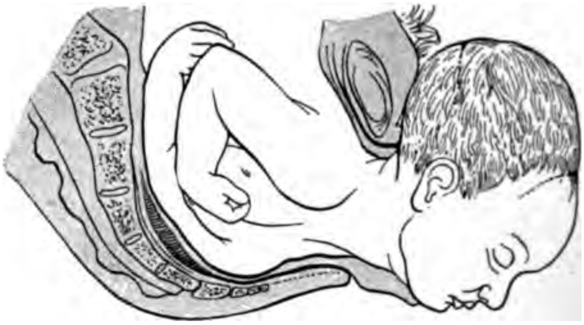
Fig. 76.



The expulsion of the head, the face passing over the pelvic floor. (Farabœuf and Varnier.)

As descent continues the head comes down upon the floor of the pelvis. It is found that little space is left for the finger to reach the anterior fontanelle. The vertex gradually turns from left to right until the occipital bone enters beneath the pubic joint. The posterior fontanelle is then in the middle line of the pelvis, and rotation is complete. As labor proceeds the vertex sinks lower and lower. The swelling of the scalp known as the caput succedaneum becomes larger, and finally the scalp is visible between the labia.

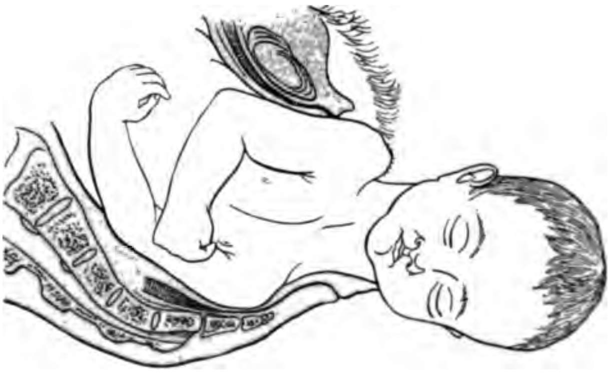
FIG. 77.



The birth of the head. (FARABOEUF and VARNIER.)

EXPULSION AND EXTERNAL ROTATION.—As the head descends the vertex fills the vulva, while the face remains partially upon the pelvic floor. Under the influence of a reflex stimulation from stronger pains the head passes through the vulva and emerges from the perineum, the vertex turning toward the side toward which it pointed while within the pelvis.

FIG. 78.

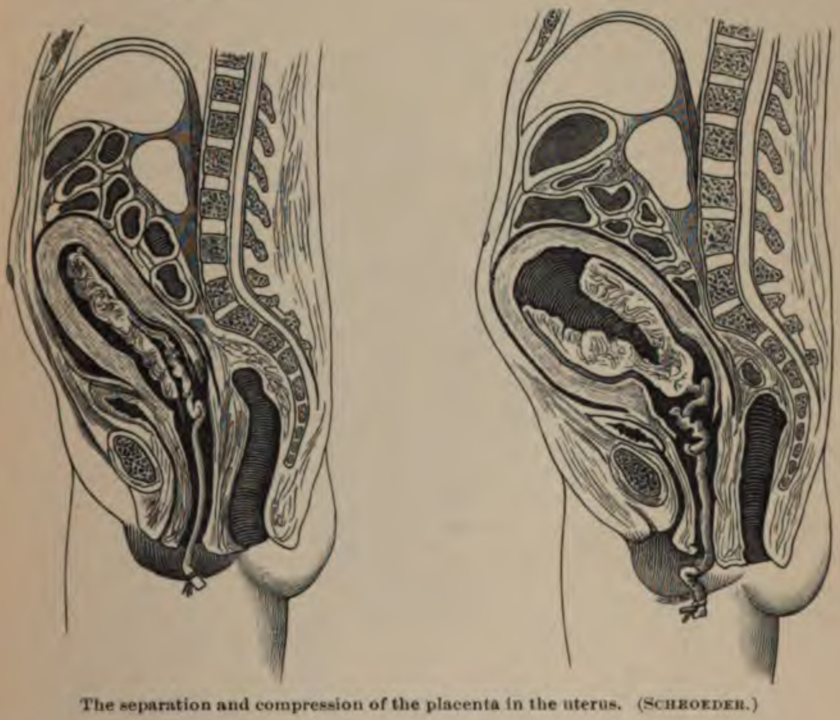


Right shoulder engaging beneath pubes. (FARABOEUF and VARNIER.)

THE BIRTH OF THE TRUNK.—The shoulders of the child descend through the pelvis until the left or posterior shoulder has reached the pelvic floor. The resistance which it there meets causes the descent of the right shoulder, which is anterior, and this shoulder gradually emerges beneath the pubic joint. It is usually delayed beneath the pubes by lateral flexion of the trunk, which enables the posterior or left shoulder to pass over the perineum. When the shoulders are born the hips and legs of the child pass readily out of the birth-canal.

The Third Stage.—A sign of the third stage of labor is the shape of the abdomen, which contains a tumor above the pubes as large as two fists. Expulsive efforts usually cease after the birth of the child. There is a slight discharge of blood from the vagina, while the presence of the umbilical cord shows that the placenta is within the uterus.

FIG. 79. FIG. 80.

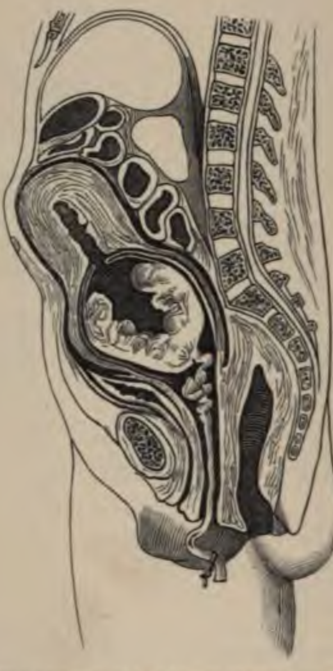


The separation and compression of the placenta in the uterus. (SCHROEDER.)

After a variable time, which depends upon the patient's degree of exhaustion, uterine contractions again occur. The patient contracts her abdominal muscles strongly. The placenta becomes separated from the wall of the uterus by uterine contraction and the formation of blood-clot between the placenta and uterine wall. The placenta presents at the vulva by one edge, with its fœtal surface anterior, and is expelled folded together upon itself. The membranes form a cord behind the placenta.

DIAGNOSIS OF THE THIRD STAGE OF LABOR.—Cases are sometimes observed in which it is necessary to exercise caution in diagnosticating the existence of the third stage of labor. In cases of illegitimate pregnancy, where the patient conceals her condition as long as possible, the physician may be summoned after the removal of the child, when the cord has been cut off or where a portion of the placenta has been removed. A twin-pregnancy may have been present, and one placenta may have been expelled, while the other remains. In very rare cases, where the fœtus has been decomposed, a portion of its body is left in the uterus with the placenta. It is necessary invariably to examine all cases having enlargement of the abdomen, or vaginal bleeding, by combined vaginal and abdominal examination. In suspicious cases the vulva and vagina should be inspected, and bleeding, lacerations, membrane, or cord, or placenta, should be seen and noted. The vagina should then be thoroughly douched, and the physician should make a thorough examination with the aseptic hand. If the os is tightly closed and other evidences exist of recent labor, with retained placenta, the os should be dilated with the fingers or dilators, the uterus thoroughly irrigated and examined to ascertain the presence of placenta, membranes, or blood-clot within its cavity. The statements of the patient or of those about her are of no value in these cases, because of the frequent attempt to deceive and conceal.

FIG. 81.



The placenta in the lower uterine segment just before expulsion. (SCHROEDER.)

Rotation caused by {
Good flexion
resisting pelvic floor
good uterine pains
proportionate size of
pelvis & head to
cause resistance

CHAPTER II.

THE ESSENTIAL PHENOMENA AND TREATMENT OF SPONTANEOUS LABOR.

The essential phenomena of spontaneous labor are first the adaptation of the entire fœtal body to the uterus and pelvis of the mother by universal flexion; the presenting part if the head is caused to flex by the lower uterine segment. If the proportionate size of the pelvis and the head is such that the head experiences resistance as it enters the brim of the pelvis, flexion is increased from the fact that the fœtal head is so placed upon the spinal column that the longer arm of the lever composed by the head is anterior to the centre of the spine. Pressure upon the head will cause the chin to descend upon the chest and the occiput to bend downward away from the back. In cases where the pelvis is of ample size for the head, flexion is but partially developed when the head enters the pelvic brim.

As the head engages, it is in an oblique relation with the axis of the pelvis. The head not only flexes but is turned toward one or other of the shoulders, a lateral obliquity. This is seen in an exaggerated extent in presentations of the parietal bone. If flexion is not complete, its absence creates also a partial obliquity in the antero-posterior diameter of the head. The same phenomenon is present to some extent in the engagement of the trunk. The practical importance of the obliquity of the trunk and fœtus in labor lies in the fact that such obliquity may bring a larger diameter of the fœtus in relation with those of the pelvic brim and may thus cause delay and difficulty in labor. Usually obliquity is not pronounced and gradually yields under good expulsive force to the normal mechanism of labor.

As the head passes through the pelvic brim, its anterior portion impinges against the wall of the pelvis. The lateral surfaces of the pelvis show an indistinct division at the junction of the anterior five-eighths with the posterior three-eighths. This is of itself not sufficient to turn the head as it descends, but it undoubtedly aids in so doing if the pelvis and the head fit tightly. Under the force of uterine and abdominal muscular contractions the head descends to the pelvic floor. Here the resistance of the pelvic floor is a primary and important element in producing rotation. The pelvic floor is open at the vulva and the head turns in the direction of the least resistance, the presenting part sinking lowest and turning to the front. The phenomenon of rotation is possible only when flexion is present, for otherwise a diameter of the head longer than the average diameter of the pelvic cavity is brought into relation with the pelvis with resulting impaction. When rotation is complete, the presenting part appears at the vulva and the antero-posterior diameter of the head corresponds with the antero-posterior diameter of the pelvic floor.

At the moment of expulsion, the anterior segment of the pelvic floor is pushed strongly upward beneath the pubes, the posterior segment of the pelvic floor is pushed downward and backward, the backward displacement of the coccyx at the sacrococcygeal joint favoring this phenomenon. Between these two segments the head emerges as one might pass between two swinging doors by pushing one door away from him and pulling the other door towards him. The descent and rotation of the shoulders imitates the passage of the head. As the occiput is pressed upward beneath the pubes while the face passes over the pelvic floor by a motion of extension, so the anterior shoulder is pressed strongly upward beneath the pubes and the posterior shoulder by lateral bending of the trunk passes over the pelvic floor. As the hips are much smaller than the shoulders they may emerge without rotation.

After the expulsion of the child the uterus remains apparently quiescent for from fifteen minutes to an hour. Meanwhile blood is clotting in the sinuses of the womb and in the placenta. A thin clot of blood is often found upon the uterine surface of the placenta. The placenta gradually separates by diminution in the area of its attachment to the uterus, by the presence of a thin blood-clot and by clotting in uterine sinuses and in its own substance. The uterus is finally roused to contraction, and by a miniature labor the placenta is folded upon itself, its uterine surfaces pressed together, and presents by one edge at the vulva. It is then beyond the reach of the expulsive segment of the womb, and its complete expulsion depends upon the action of the abdominal muscles and the fixation of the patient's diaphragm. With straining efforts, the placenta slips out from the vagina, the membranes forming a cord behind it. More or less clotted blood may precede or follow the expulsion of the placenta.

The Management of Spontaneous Normal Labor.—The care of the patient during labor or the management of normal labor demands watchfulness and patient observation. It must be remembered that the process of labor requires prolonged and more or less severe muscular exertion, and this in addition to the suffering which the patient experiences. Although in normal birth the degree of suffering and excitement will not reach surgical shock, still no patient passes through labor without great fatigue. It is then imperative that at the first symptoms of labor the patient be placed in the best possible condition for birth, and that during this process everything be done to sustain her strength and lessen her suffering. The practice of leaving cases of labor without care until possibly the membranes rupture is certainly negligent, and accounts for some of the cases in which the patient becomes exhausted and labor must be ended by instruments.

The Treatment of the First Stage of Labor.—In order that labor should proceed without delay it is necessary that the bladder and rectum should be thoroughly emptied. This is often accomplished spontaneously, the patient passing urine frequently and having a copious evacuation from the bowels as labor proceeds. It is better, however, not to wait for spontaneous defecation, but to give a copious enema at the beginning of labor. This should consist of castor-oil, two ounces, hot soapsuds, two quarts, and spirits of turpentine, two teaspoonfuls, beaten up with the yolk of a raw egg. This should be thoroughly stirred and given to the patient at a temperature of 110° F., the patient lying upon her left side and the enema being passed as high as possible. This will secure a prompt and thorough evacuation.

The patient's dress should be loose and comfortable and sufficiently warm. A night-dress might be worn, with long woollen stockings and slippers, and a woollen dressing-wrapper. The patient's hair is often conveniently braided. An old night-dress is often chosen, which may be torn or cut off if necessary. Her bed is prepared by making it double, first with rubber sheet and draw-sheet, and over that another sheet, rubber sheet, and draw-sheet. A single light blanket is usually sufficient, with a sheet, for covering. A spread is unnecessary and in the way.

During the first stage of labor the patient is frequently nauseated and may vomit. She cannot retain a large amount of food, and yet she should not pass through a prolonged period of muscular exertion without nourishment. The most digestible and concentrated food should be given her in small quantities and at frequent intervals. Hot broth, milk, gruel, or egg beaten with milk or whiskey are useful during labor. She should be fed every four hours, the quantity taken depending upon her ability to retain it.

Much can be done during the first stage of labor to allay the mental suffering of the patient by kind and intelligent encouragement. She will naturally complain of pain which seems useless and without result. When the cause of this pain is explained to her and its purpose an intelligent patient will bear more cheerfully the first stage of labor. It is well to allow her to remain in a comfortable posture, and in first labors, especially, it is advisable to have the patient remain up and about her room until the second stage begins. This does not mean, however, that she is to walk about and exhaust herself in efforts to keep up. She may sit in a large chair or lie at intervals upon a couch, changing her position as desired.

As the first stage of labor often lasts from twelve to twenty hours in first labors, the patient will require sleep during this period. When evening comes her room should be darkened, she should be put to bed, and an effort made to procure sleep by giving a mild sedative. Hydrate of chloral is especially useful at this period of labor. It is convenient to give it in doses of ten grains each, dissolved in simple syrup and water.

The following will be found useful as a sedative in the first stage of labor:

Hydrate of chloral	grs. 160.
Bromide of sodium Bromide of ammonium	each grs. 160.
Simple syrup.	℥ ½.
Water to make	℥ 2.

A teaspoonful every hour until three doses have been taken.

The nurse may be instructed to give the first dose at bedtime, repeating it in an hour until in all three doses have been taken. Observation has shown that the action of chloral does not delay, but expedites labor. Some have obtained good results from the use of antipyrine or phenacetin, given in doses of five grains. Codein in half-grain doses often acts well with highly nervous patients.

The Antiseptic Preparation of the Patient for Labor.—In sound and healthy patients, no vaginal douche or interference is required before labor. The hair about the external genital organs should be trimmed as closely as possible or removed by shaving. The patient should be directed to wash herself thoroughly with tincture of green soap and water, using sterile gauze or linen which has been boiled instead of a sponge. The external parts should then be thoroughly washed with boiled water by the nurse, and then with bichloride of mercury solution, 1 : 2000. A sterile vulvar dressing and T-bandage should then be worn. After the emptying of the bowel or bladder during labor, the tissues about the meatus and anus should be thoroughly cleansed in the same manner. In cases where there has been during pregnancy a vaginal discharge of pus or mucopus, the vagina should be prepared for labor, in addition to the external cleansing as just described, by thorough scrubbing with pledgets of sterile cotton with tincture of green soap and water, then copiously douched with sterile water and then with lysol 1 per cent.

Attention has been called to the possibility of infection of the genital tract through water, which gains access to the vagina in the ordinary tub bath. While the full bath may be taken for general cleanliness, it exposes the patient to slight risk of vaginal infection.

The Physician's Duties.—When a physician is summoned to a case of labor he may first find it necessary to make a diagnosis of the actual presence of labor. This can be done in two ways—by observing the presence or absence of uterine contractions and by an examination which will ascertain the degree of dilatation present. In patients who are excessively nervous, so that a thorough examination is difficult, a small quantity of chloroform or bromide of ethyl will be of great service. It is, in some cases, so important that the actual presence of labor be recognized and its progress determined that partial anaesthesia is justifiable.

It is possible for a patient to simulate labor so perfectly as to deceive a physician unless he makes an examination to confirm the diagnosis. While the presence or absence of uterine contractions can be proved by abdominal palpation, still an internal examination is necessary to ascertain the degree of dilatation which is present.

In the majority of cases the personal presence and assistance of the physician are needed from the time when the first stage of labor ends and the second begins. This period is announced by the rupture of the membranes and the partial escape of the amniotic liquid. The fœtus after this time is subjected to direct pressure, and hence may be in danger if labor is delayed. The soft parts of the mother are also subjected to pressure as soon as the membranes rupture, and destruction of tissue may result. The physician should study the passage of the fœtus through the pelvis and observe the strength or weakness of the uterine contractions, in order that he may intelligently protect the interests of both mother and child. During the first stage of labor his presence in the sick-room will be rarely required for more than brief intervals, but while the expulsion of the child is taking place he should be present.

The Treatment of the Second Stage of Normal Labor.—The most favorable posture for the patient during the second stage of normal labor is that lying upon her left side, her hips at the edge of the bed, her thighs flexed, and her legs flexed upon the thighs, while her shoulders are turned toward the opposite side of the bed. Her face is turned away from the physician, who should sit at the right side of the bed, facing the patient's feet, so that with his right hand he may support the perineum at the moment of birth. If the bed be a narrow one, the nurse may stand, until the child is born, upon the opposite side of the bed from the physician, near the patient's head, where she can conveniently administer an anæsthetic. If the nurse is not experienced in giving ether or chloroform, the anæsthetic may be retained by the physician himself, and the nurse may stand behind him, holding the inhaler or the napkin upon which the physician may pour the quantity of anæsthetic which he wishes the patient to have. In this way the amount of anæsthetic administered is regulated entirely by the physician. As soon as the birth of the child occurs the nurse leaves her station and attends to the care of the infant.

The Antiseptic Management of Labor.—Unless the physician has arrived in the presence of a critical emergency, there is no excuse for lack of thorough preparation as regards antisepsis. If the patient is healthy, she requires no preliminary vaginal douche before labor. Before each examination the attendant must scrub his hands thoroughly with soap and hot water, using a nail-brush; then scrub them thoroughly in hot water, and then scrub them in bichloride of mercury solution, 1:1000. No lubricant is required in normal cases for the finger, for the increased secretion of mucus renders this unnecessary. When it is evident that the second stage of labor is in full progress the physician, seated by the bedside, should have within reach a small sterilizer containing a pair of blunt-pointed scissors, three pairs of hæmostatic forceps, a small English catheter, a pair of long uterine dressing-forceps, ligature material for the cord, which should be preferably silk, needles, needle-holder, chromicized catgut, silk-worm gut and two pairs uterine tenaculum forceps. These articles should have been thoroughly sterilized and placed in a solution of lysol or creolin, one teaspoonful to the pint. A large basin should be within easy reach filled with solution of bichloride of mercury, 1 : 2000, and containing absorbent cotton or pieces of old, clean linen. There should also be at hand fluid extract of ergot, ergotin or aseptic ergot, whiskey or brandy, strychnine pellets for hypodermatic use, and a hypodermatic syringe in good order. A small package of iodoform, 10 per cent. gauze, unopened, should also be ready in case it is necessary to tampon the uterus for hemorrhage. The nurse should see that an abundant supply of hot water is ready, and that a dry, warm blanket is prepared to receive the child. She should also prepare a clean cup or small bowl filled with saturated solution of boracic acid, in which are immersed a dozen pieces of old, soft linen. She should also have ready a roll made of a folded pillow or a blanket to place between the patient's knees. Beneath the foot of the bed, near the physician, should be a receptacle for waste material, and also a basin and a towel for the placenta. As normal labor proceeds the physician, having thoroughly cleansed his hands, seated beside his patient, should examine her sufficiently often to note the advance of the child or its failure to do so. His left hand is conveniently placed to palpate the uterus from time to time, observing the character of its contractions and the descent of the child.

Abdominal Palpation During Labor.—A physician who is experienced in abdominal palpation can follow the course of labor by this means in a very satisfactory manner. The head of the fœtus can be felt to descend into the pelvis. As labor proceeds the back and shoulders of the child gradually descend, while the hand placed upon the uterus during a pain can appreciate in this way better than in any other the strength of the uterine contractions and their increase or diminution. Symptoms of delay or exhaustion during labor can be more readily appreciated by palpation than by any other method. This procedure has the great advantage of very greatly diminishing the number of vaginal examinations, thereby lessening the danger of septic infection. It is also less disagreeable to the patient, and gives the physician much better information regarding the state of the uterine muscle than can be obtained in any other way.

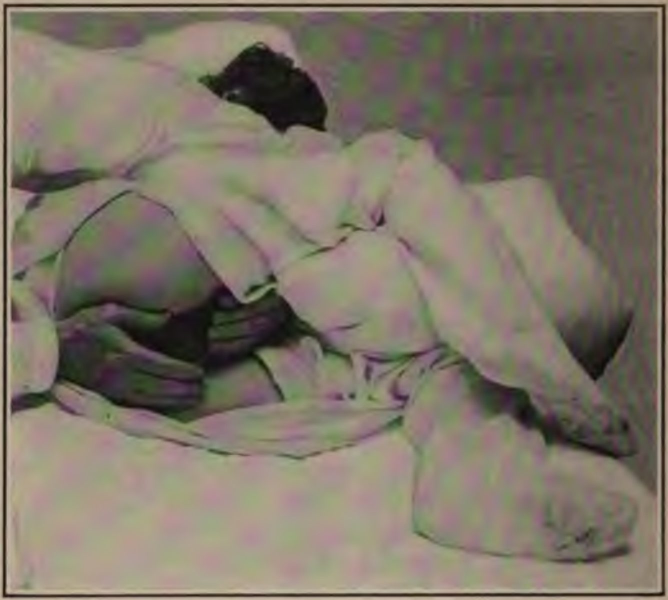
Anæsthesia in Labor.—The question of the use of anæsthetics in normal labor has occasioned much discussion. Complete anæsthesia is not required in normal labor; but there is no reason why the pains of the second stage of labor, even in normal cases, should not be lessened by partial anæsthesia. There is less danger of the tearing of the perineum and less danger of injury to the child if an anæsthetic be used. During the first stage of labor the patient will constantly request that something should be given her to relieve her pain. If she has ever taken an anæsthetic, she will beg that anæsthesia be afforded her. It is never safe to give the patient in labor an anæsthetic unless her labor is so far advanced that she can be delivered, if necessary, under anæsthesia. She will often be greatly comforted, however, if she is allowed to inhale sufficient anæsthetic vapor to benumb slightly her sufferings, and also to lead her to believe that she is obtaining an anodyne. This is often accomplished by adding to spirits of cologne a small quantity of chloroform, so that the odor of the cologne is slightly altered. A few drops of ether on a handkerchief, when inhaled, have very feeble anæsthetic power, but lead the patient to believe that she is receiving an anæsthetic. Patients can sometimes be made to suffer less by causing them to breathe deeply and rapidly, when a condition of partial apnœa results, in which their suffering is less acute. It is, however, a most unwise thing to yield too promptly to the patient's wish for anæsthesia and to allow the labor to be delayed by the premature administration of ether or chloroform.

Obstetric nurses may be trained to give anæsthetics in the manner which is necessary in obstetric practice. Ether or chloroform should not be administered until the second stage is well established. It may then be intrusted to the nurse, who will drop the quantity ordered upon a napkin and allow the patient to inhale it at the height of her pain. As the birth proceeds the physician will inform the nurse when the expulsion of the head is expected. When the head distends the perineum the pains are commonly made much more severe by reflex stimulation. This leads to severe expulsive pains, in which the head may be forcibly expelled. When this process begins the anæsthesia should be sufficiently advanced to lessen the violence of expulsive effort.

The Management of the Stage of Expulsion.—The physician will keep the parts thoroughly aseptic by frequently cleansing them with cotton or soft linen taken from the basin containing the solution of bichloride of mercury, 1 : 2000. When the vertex appears between the vulva the roll should be placed between the patient's knees, thus raising the upper, right thigh. The physician may then pass his left hand over the patient's abdomen and between her thighs, so that his fingers may rest upon the vertex of the fœtal head. With this hand he may govern the rate of expulsion of the head, maintaining flexion at the same time. The other, his right, should be thoroughly wet in the 1 : 2000 bichloride solution and then be laid transversely across the pelvic floor, the ulnar portion of the hand covering the anus. The radial border of the hand should be a half-inch to three-fourths of an inch below the posterior commissure of the vagina. As the head descends to the pelvic floor the right hand will support the pelvic floor, but should leave the edge of the perineum at the commissure free to dilate, or, if needed, to tear.

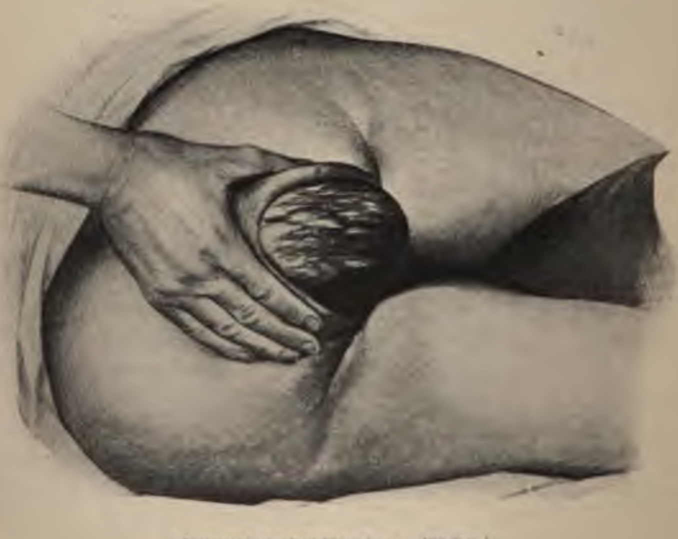
The Prevention of Laceration: The Birth of the Head.—Experience has shown that where the birth-canal is not well developed, or where the head is large and a tear is inevitable, it is better to have this lesion occur in the median line than to have the pelvic floor injured, while the skin of the perineum may remain intact. As the head descends and rotates upon the pelvic floor the vertex will gradually emerge until it is evident that, unless opposed, the head will soon escape from the vulva. There is least danger of tear if the head be expelled between the pains. With his left hand the physician can regulate the advance of the vertex, while with his right he protects the pelvic floor. Should a sudden expulsive effort be made he may slip one hand over the other, covering the vulvar orifice with both, thus preventing expulsion at that moment.

FIG. 82.



Delivery of fœtal head.

FIG. 83.

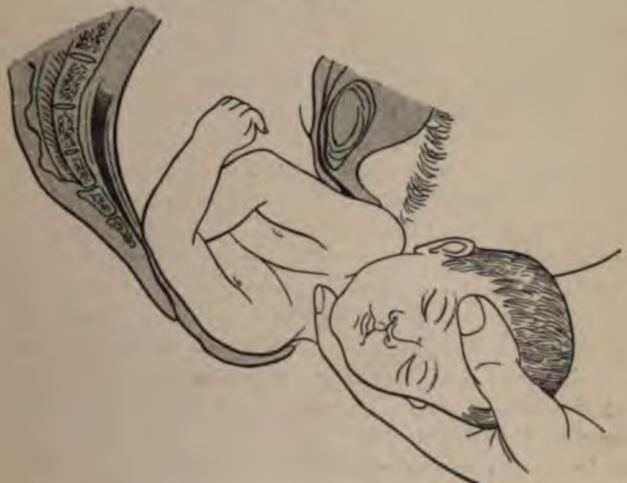


Protection of pelvic floor. (BUMM.)

When he decides that sufficient dilatation has taken place, and that the head may be born in the next pain, the anæsthetic should be given sufficiently freely to abolish the sensation of pain. It is proved by the statements of patients that while they do not feel the actual passage of the child from the body, they hear and remember what is said about them and know perfectly where they are. This abolition of suffering with the retention of consciousness is rarely seen except in labor, and may be termed obstetric anæsthesia. With the patient in this condition the physician may allow the head to emerge as far as he chooses, governing its exit by the left hand, while with the right he cautiously works the perineum and pelvic floor backward from the forehead. The head, after it emerges, will turn with its vertex toward the thigh, toward which it originally pointed. As soon as the head is born the nurse should see to it that the mouth is thoroughly cleansed with soft linen and a saturated solution of boracic acid. The same precaution must be taken in the care of the eyes as soon as the head is born. A slight pause usually occurs after the expulsion of the head. If a loop of cord is around the child, it must be loosened by gentle traction and slid over the body of the child.

The Birth of the Shoulders.—The birth of the shoulders is a procedure equally important with that of the head. The right hand should still be free to protect the pelvic floor, while the left hand may grasp the fœtal head beneath the jaw and with the occiput also included in this grasp. The head should be raised toward the abdomen of the mother. If no uterine contractions occur immediately, the physician may excite them by rubbing or kneading the uterus with the elbow of his left arm. The anæsthetic should still be in readiness, as

FIG. 84.



Aiding the delivery of the shoulders by raising the head. (FARABOEUF and VARNIER.)

the patient will often, by a sudden effort, force the shoulders out and tear the pelvic floor. As with the birth of the head, so with the shoulders, a mild degree of anæsthesia will enable the physician to prevent an injury.

Ligation of the Cord.—When the head and shoulders have been born the rest of the child's body passes readily into the world. When the child is born it should lie upon its right side, close enough to the mother so that no traction be made upon the cord. The mouth and eyes having been cleansed, the physician should take the cord in the fingers and note its pulsations. There is abundant evidence to show that it is better for the child to allow the cord to stop beating before tying it. Several minutes often elapse before the beating of the cord ceases. When this occurs it should be firmly tied three fingers'-breadth from the child's navel. A second ligature is applied on the placental side, about an inch from the third. The cord should then be cut with blunt-pointed scissors and the child removed and wrapped in the blanket warmed for it. The mother may then turn upon her back for the completion of labor in the third stage.

The Treatment of the Third Stage of Labor.—Ordinarily the separation of the placenta is caused by the growing smaller of the uterus and by the intervention of clotted blood between the placenta and wall of the uterus. This process, occurring gradually, requires some twenty minutes or half an hour for its completion. During this time the patient may complain of no pain, although the uterus contracts at varying intervals. The left hand of the physician should rest upon the uterus to ascertain positively that it is properly contracted. When the patient complains that she is having more pain she should be urged to bear down, for observation shows that the placenta is delivered, not by contractions of the uterus, but by the abdominal muscles. The physician may aid the expulsion of the placenta by taking the womb in his hand as well as the abdominal wall will permit, his fingers being passed down behind the fundus of the womb in the median line at the brim of the pelvis. The muscles above the thumb should press upon the anterior surface of the womb in the median line. By squeezing the womb when the patient has expulsive pain the delivery of the placenta will be hastened. The placenta will appear at the vulva, presenting by its fœtal surface and generally folded together like a broad leaf folded once or twice upon itself. It may then be grasped by the fingers and gently removed, care being taken not to tear the membranes. The nurse should hold the basin for the purpose to receive the placenta, covering the whole with a towel and saving the placenta for examination. When the after-birth has been removed the physician will do well to take away any blood-clots which may remain in the vagina, and also to assure himself that no membranes or blood-clots of size remain within the uterus. Before the introduction of the hand into the vagina it must be thoroughly rinsed in bichloride solution. The left hand of the physician should remain upon the abdomen and uterus to determine the condition of the womb. In normal cases the womb remains, while contracted, just above the brim of the pelvis. In perfectly normal patients it may not be necessary to give ergot immediately after labor, as the uterus will contract without it. It is, however, a safe precaution to administer a teaspoonful of the fluid extract of ergot when the uterus has been emptied.

The Diagnosis of Laceration.—The care of normal labor is not complete until the patient has been made clean and aseptic and until the physician is assured that no laceration requiring suture has occurred. As soon as the labor is over and the womb well contracted it is proper to give a copious vaginal douche of bichloride solution, 1 : 4000. This should be given at the temperature of 110° F. and in quantity not less than two quarts. A new fountain syringe is to be used, the bag of which should be held not more than three feet above the patient's head. The external parts should be thoroughly cleansed with bichloride solution, 1 : 2000. To determine the presence or absence of lacerations examination should be made by sight and by touch. Experience has shown that clotted blood may adhere to a lacerated surface, giving the feeling to the finger of sound tissue. It cannot be too strongly stated that it is the positive duty of the physician, and of no one else, to make such examination, and, if necessary, to settle this point. The statement of those who assert that they have had thousands of cases of labor without laceration proves that they at least made no adequate examination to discover the condition. To examine by sight the patient may be turned upon her back or left side, the parts exposed, and then, if needed, a candle may be used to furnish light, while the physician inspects the vulva, and sponges, with absorbent cotton dipped in bichloride solution, 1 : 2000, the perineum. If he suspects a laceration higher up, which is not visible from below, he may insert his finger into the rectum and raise the pelvic floor for inspection in this way.

The Treatment of Lacerations.—Before the question of treating a laceration can be solved it is well to define what should be meant by the term laceration of the perineum. It has been often seen that in perfectly normal labor the fourchette may be torn and the tissue beneath sufficiently to make a tear of between one-half and three-fourths of an inch in extent.

These can readily be closed by suture. Such lacerations heal promptly if sutured, the patient's condition afterward being satisfactory. Lacerations extending through the mucous membrane should be closed under antiseptic precautions. Small tears which do not require sewing should be kept powdered with a mild antiseptic. In hospital and in private cases boracic acid may be used. We must again call attention to the fact that after every normal labor the physician should examine his patient to ascertain the presence or absence of laceration. No case can be considered normal unless such examination has been made and the absence of laceration proved.

The Application of Dressings.—The care of normal labor is not complete without the application of proper dressings to the vulva and thorough examination to determine the presence or absence of bleeding and of shock. The vulva must be covered with a sterile antiseptic absorbent dressing, which is removed and burned when soiled. This may be composed of sterile cheesecloth soaked in bichloride solution, 1 : 2000, or any suitable material thoroughly impregnated with an antiseptic. Over this pad should be applied a T-bandage or a slip pinned to the binder to retain the pad in place. While the abdominal binder is not necessary with young women after the first confinement, it is often useful with weaker patients to keep the abdominal muscles quiet and support relaxed tissues. The physician will determine the presence or absence of bleeding by palpating the uterus and counting the patient's pulse and by inspecting the vagina. Should surgical shock be present, it must be treated with strychnine, one-twentieth grain, hypodermatically. The patient should be placed in warm, dry clothing, upon perfectly clean linen, and care taken to see that her feet and legs are warm. She must be kept perfectly quiet and permitted to sleep as soon as possible.

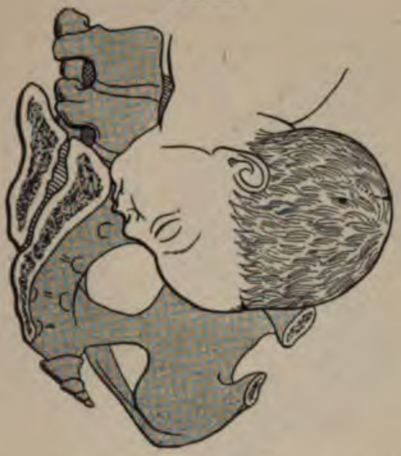
CHAPTER III.

FACE PRESENTATIONS AND THEIR MANAGEMENT.

Face Presentations: Development and Nomenclature.—Although in the great majority of cases the occiput descends and presents in labor, in others the chin becomes lower than the occiput and forms the lowest portion of the head during labor. This is termed face presentation. In some cases this condition is but imperfectly developed, the chin descending but partially in the pelvis and the brow of the child lodging against the brim of the pelvis. This is termed brow presentation. In naming these presentations two methods are in use—one consists in taking the forehead of the child as a cardinal point and in naming positions in accordance with that part of the pelvis toward which the forehead is directed. Face presentations have but two positions. As for others, the most usual are those in which the forehead is directed toward the mother's left side, the back of the child being also on the left. These are termed fronto-anterior and first positions in face presentations, the most common of these being left fronto-anterior. In these positions the chin is upon the right side of the pelvis and obliquely behind, at the right sacro-iliac joint.

Others prefer to take as a cardinal point the chin of the child, because it is lowest, and hence presents to the finger of the examiner, being the presenting part. Some would term the positions already described as right mento-posterior. Brow presentations are but partially developed face presentations and have no separate nomenclature.

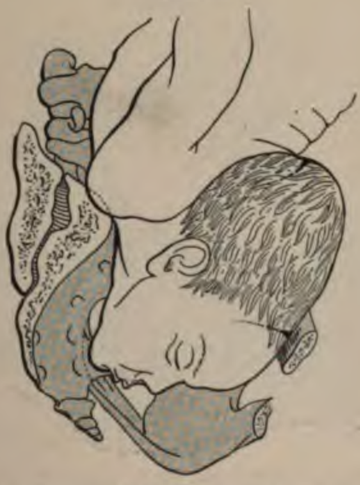
FIG. 85.



Brow presentation. (FARABOEUF and VARNIER.)

Mechanism of Labor in Face Presentation.—Labor occurs in face presentations by the development of strong extension. The occiput is forced upward against the back of the child's neck, while the chin projects lowest in the pelvis. The forehead is in front of the median line upon the left side. As the head descends the chin comes upon the pelvic floor, the forehead turns behind, and the chin rotates for-

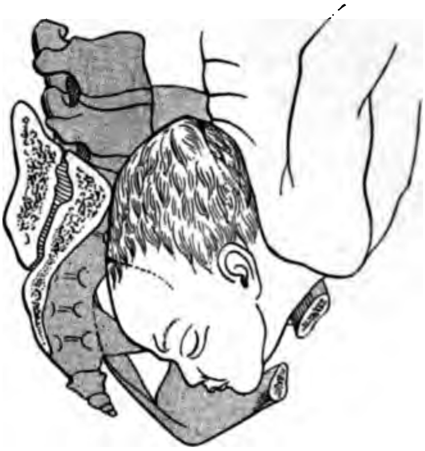
FIG. 86.



Face presentation, Descent of the fœtus. (FARABOEUF and VARNIER.)

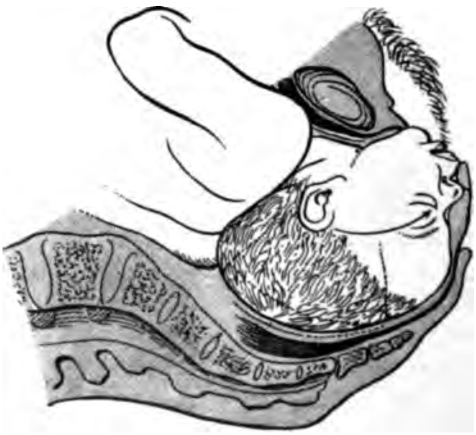
ward under the pubic joint. The chin gradually protrudes beneath the pubic joint, while the head is born by strong flexion of the occiput over the pelvic floor. The birth of the shoulders is accomplished in the manner in which this occurs in normal labor. In second positions of face presentations birth occurs in the same manner, with the exception of the fact that the chin rotates from right to left, instead of from left to right.

FIG. 87.



Face presentation. Anterior rotation of chin. (FARABOEUF and VARNIER.)

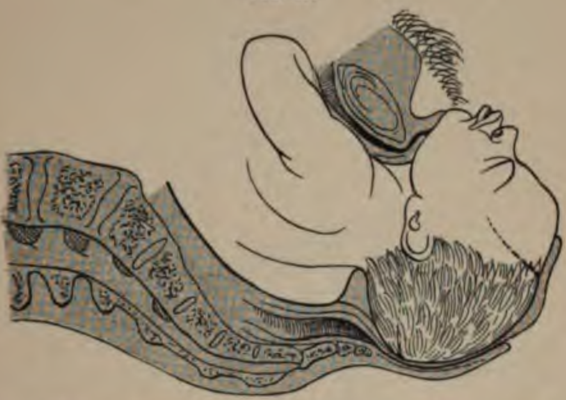
FIG. 88.



Face presentation. Birth of the head. (FARABOEUF and VARNIER.)

Diagnosis of Face Presentation.—In brow presentations labor is impossible, as a rule, until the position of the head is altered. Face presentations are found in cases where the head and pelvis are not proportionate in size, and where some peculiarity in the shape of the head favors extension rather than flexion. This condition is diagnosticated by palpation, when the occiput will be found above the brim of the pelvis, instead of presenting as in normal cases. The back of the child is often not so near the mother's abdominal wall, and hence heart-sounds are not so plainly heard.

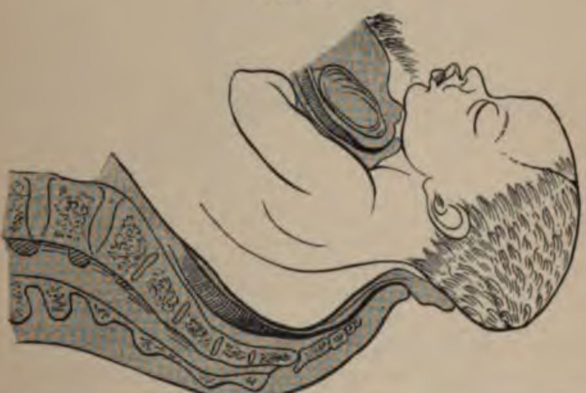
FIG. 89.



Face presentation. The head on the pelvic floor. (FARABOEUF and VARNIER.)

By internal examination the chin is detected and the face occupying the usual position of the sagittal suture. The forehead of the child may sometimes be felt, but often is not readily reached.

FIG. 90.



Face presentation. Birth of the head. (FARABOEUF and VARNIER.)

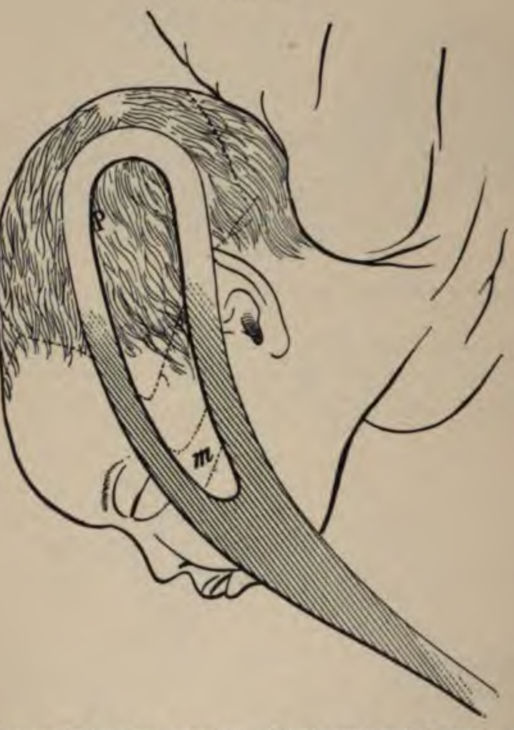
Treatment of Labor in Face Presentation.—The management of these presentations consists in keeping the membranes unbroken as long as possible. If birth is to occur in face presentation, the chin must descend and turn in front. If the membranes rupture early, descent is prevented and the head may become impacted in the pelvis.

The patient should be urged not to strain violently and should be kept lying upon the side toward which the back of the child is pointed.

After the membranes break the physician's care should be to watch the rotation of the chin. As long as this continues to move toward the front, labor is progressing and should rarely be interfered with.

The mother's strength must be preserved and every effort made to prevent exhaustion. When, however, the head does not descend and the chin fails to turn to the front, one of several procedures may become necessary.

FIG. 91.



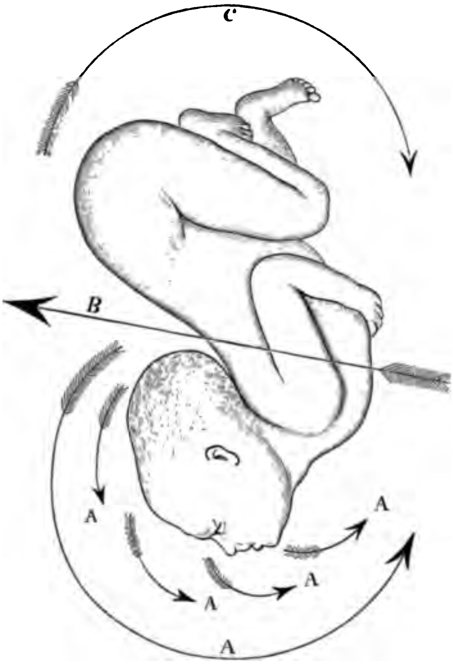
Forceps in face presentation. (FARABOEUF and VARNIER.)
P. Parietal eminences. m. Malar protuberances.

All of these require anæsthesia. A pair of narrow-bladed axis-traction forceps should be at hand and aseptic. Tarnier's forceps are well suited for use in these cases. The patient having been properly placed and the vagina cleansed, the bladder emptied by catheter, the physician introduces the hand which is opposite the chin of the child. He determines whether the head is impacted in the pelvis and whether manipulation can easily dislodge it. He may then endeavor to pull down the chin and bring it gradually to the front. If he can move it but partially, he may apply Tarnier's forceps to the sides of the head with axis-traction and bring the head upon the pelvic floor in this way. If the head is high in the pelvis, but movable, many advise the prompt performance of podalic version. In this chloroform is the better anæsthetic.

If the forceps are used, the blades must be carefully applied to the sides of the child's head and face and accurately fastened.

Traction should be made in the axis of the pelvis only; when the chin is beneath the pubes the occiput must be brought out by flexion over the pelvic floor. Rupture of the perineum will often occur and should be anticipated by episiotomy.

FIG. 92.



Correction of face presentation by manipulation. Arrows show direction in which various parts of fœtus are carried by operator. (THORN.)

***A*. Toward the pubes. *B*. Toward the sacrum. *C*. Breech carried toward mother's anterior abdominal wall.**

Posterior Rotation of the Chin in Face Presentation.—If the chin, instead of turning in front, rotates behind, beneath the promontory of the sacrum, labor ceases. A moment's consideration will show that, if uterine contractions persist, the head of the child and also the thickness of the chest must enter the pelvis at the same time if progress is to be made. The anterior surface of the chest is forced against the promontory of the sacrum. The fœtus becomes impacted and further progress ceases. If such a case has been going on for some hours when first seen, the child will have died from pressure.

Craniotomy in these cases is difficult, because the head must be entered through the face or forehead, which is often high in the pelvis. If the fœtus can be dislodged under chloroform, podalic version is indicated. If, however, the child is firmly held in the grasp of the exhausted uterus, it may be removed by embryotomy or more safely taken by abdominal section.

Face Presentation in Contracted Pelves.—In cases where the birth-canal is not sufficiently large to permit the passage of the head at term in face presentation Walcher's position or symphysiotomy may so enlarge the pelvis as to render the anterior rotation of the chin possible or enable the physician to push up the head and deliver the child by version. If the birth-canal be undeveloped, so that tears of the vagina and perineum may result, symphysiotomy should not be chosen.

Brow Presentation.—If the fœtus becomes impacted in brow presentation, the same problem presents which was offered in the presentation of the parietal bone. The physician must bring down the chin, making a face presentation, or dislodge the brow and push up the chin, producing a vertex presentation. In cases where the child is dead craniotomy should be performed if the head is accessible.

When delivered in brow presentation the forehead may be severely bruised, so that the eyes may be closed by swelling. In face presentation the child is in danger of choking if delay occurs in the delivery of the head and the throat is brought closely against the pubic joint. The mother suffers from longer, more painful, and tedious labor, while her chance of injury is great.

Conversion of Face into Other Presentations.—If craniotomy is not to be performed, various procedures have been proposed for changing face presentations, when impacted, into occipital.

By external manipulation it has been advised that the trunk of the fœtus be firmly grasped through the abdominal wall and that the body be raised and the face dislodged. It will sometimes be possible, with the aid of deep anæsthesia, to accomplish the desired result by this means.

CHAPTER IV.

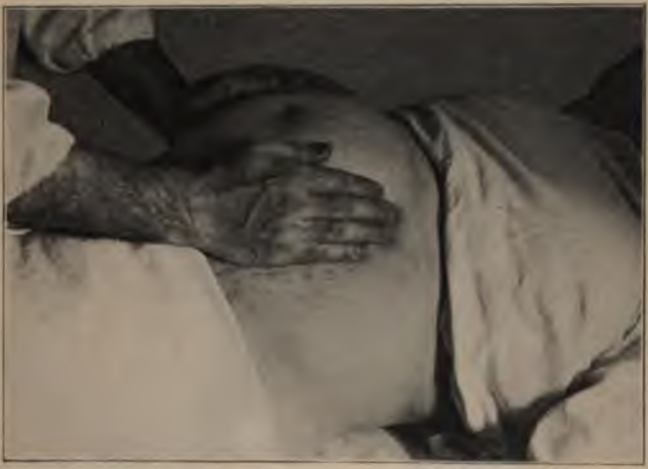
BREECH LABOR AND ITS MANAGEMENT.

Etiology.—The fœtus may present by either extremity, and spontaneous labor occur when the breech presents as well as when the head is born first. No exact cause is assigned for breech presentation, as it frequently occurs in patients with normal pelvis and when the child affords no abnormality. It is observed that breech presentations frequently occur in women in whom the lower uterine segment is deficiently developed or in whom this portion of the uterus has been repeatedly distended. During the time when the fœtus is freely movable it often presents by the breech, but usually fœtal movements result in the substitution of the head. When the lower uterine segment is not sufficiently strong and elastic to grasp and retain the head, breech presentation may develop.

Nomenclature.—Breech presentation is divided into two positions—the first and second. In the first the back and sacrum of the child are directed toward the left side of the mother's pelvis, while in the second position in breech presentation the back and sacrum are directed toward the right side of the mother's pelvis. In either case the head is found at term above the umbilicus, while the heart-sounds are heard as high as the umbilicus in many patients.

Diagnosis.—The diagnosis of breech presentation is made by palpation, when the physician fails to find the head at the brim of the pelvis. Instead, a smaller and softer body is present at the brim, which can often be carried more easily into the pelvis. The back of the child is found by palpation in its usual position, while the shoulders and head are discovered at the fundus of the uterus.

FIG. 93.

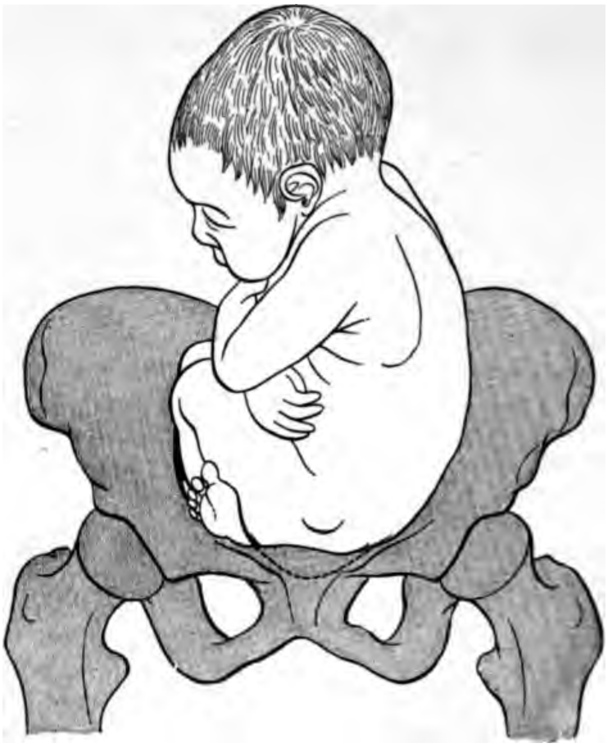


Abdominal palpation, determining the position of the fœtus: palpating the breech and the head above.

On auscultation heart-sounds are heard near the level of the umbilicus, and in rare cases, in which the back of the child is behind, heart-sounds may be heard with remarkable distinctness.

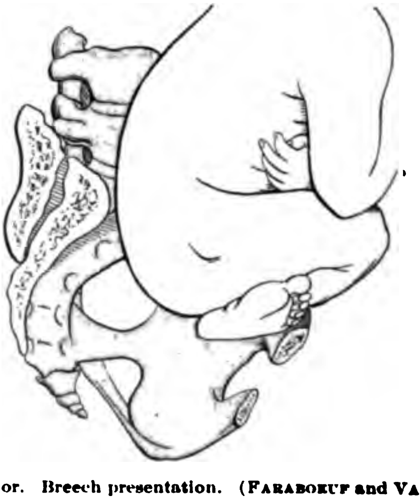
If the abdomen be inspected, in women who are thin the abdominal tumor of pregnancy may be noticed to be larger near the umbilicus than when the head presents. If vaginal examination be made during the last weeks of pregnancy, the examiner will observe the absence of the child's head from the brim of the pelvis.

FIG. 94.



First position. Breech presentation. (FARABOEUF and VARNIER.)

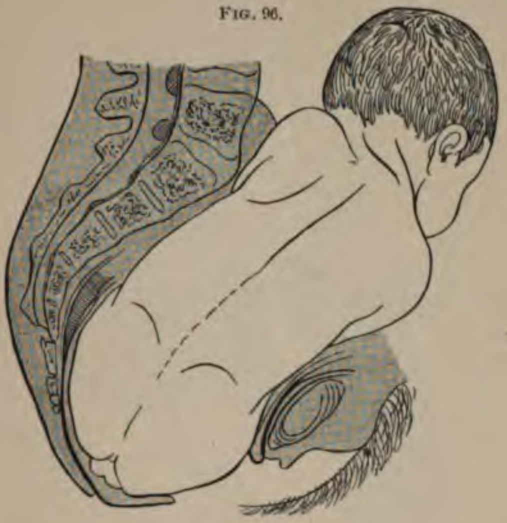
FIG. 95.



Back posterior. Breech presentation. (FARABOEUF and VARNIER.)

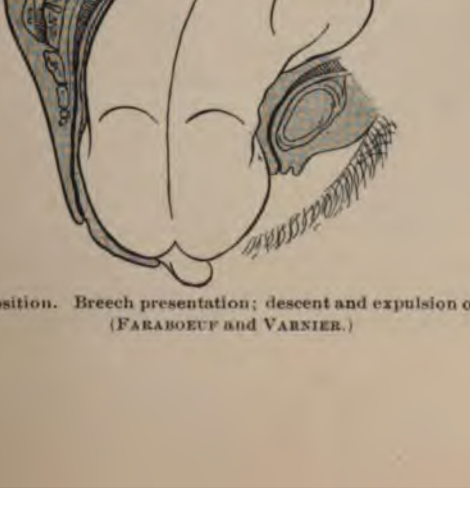
Although the breech may descend, as the head usually does, in the last two weeks of pregnancy, still the difference in shape and consistence between the two, and the fact that the breech dilates the lower portion of the uterus much less than does the head, should assist in diagnosis.

FIG. 96.



Second position. Breech presentation; descent of breech.
(FARABOEUF and VARNIER.)

FIG. 97.

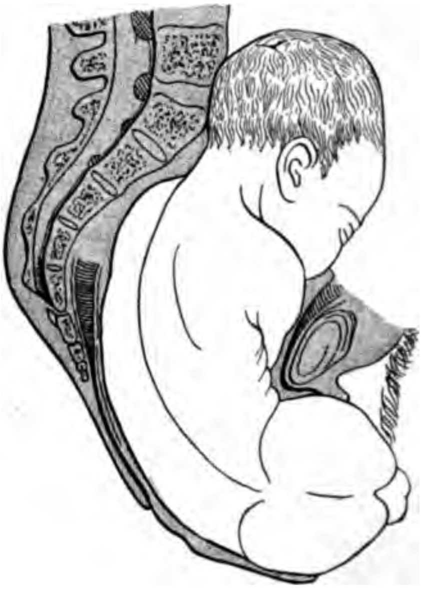


Second position. Breech presentation; descent and expulsion of breech.
(FARABOEUF and VARNIER.)

Course of Labor in Breech Presentation.—The course of labor in breech presentation consists, first, in the descent of the breech and its passage through the pelvis. The posterior hip, usually the right, comes first into the pelvic cavity, the body of the child descending with its bis-trochanteric diameter occupying the left oblique diameter of the pelvic brim. In second positions of the breech the mechanism is reversed.

The body of the child is then bent upon itself by lateral flexion. The left hip of the child passes beneath the pubic joint and pivots there, while the right hip descends over the pelvic floor. When the hips emerge the rest of the body follows readily until the arms and shoulders are reached.

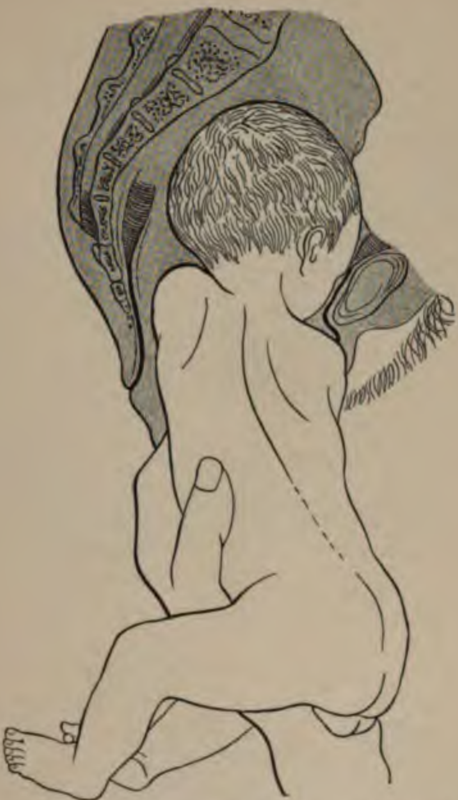
FIG. 98.



Second position. Breech presentation; descent and expulsion of breech. (FARABOEUF and VARNIER.)

In normal cases the forearms are flexed upon the arms, while the arms are carried across or flexed in front of the chest. The head is also strongly flexed. As the body descends the left shoulder and arm pivot beneath the pubic joint, while the right shoulder and arm descend into the vagina and are expelled. The left then follow readily. The shoulders being born, the head has descended to the pelvic floor in the right oblique diameter of the pelvis, the occiput toward the left and the chin below and to the right. The face and chin descend upon the pelvic floor, and strong flexion should result. This is partially caused by the occiput, which is forced strongly against the pubic joint and meeting this obstacle causes flexion to become pronounced. The occiput pivots behind the pubic joint until, by strong flexion and expulsive effort, the face has swept over the pelvic floor and perineum, when it emerges from the mother's body. The occiput readily follows.

FIG. 99.



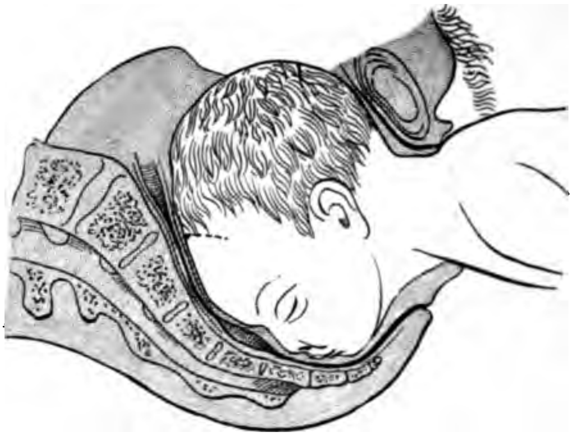
Breech presentation. Normal birth of shoulders. (FARABOEUF and VARNIER.)

In cases in which the back of the child is directed toward the right side of the mother the same mechanism obtains, although rotation is from right to left instead of from left to right. In order that the normal mechanism of labor in breech presentation may be carried out, the fœtus must be in the position of universal flexion, and the delay and difficulty in labor which often arise in these cases are caused by some variation from this attitude.

Prognosis. —The prognosis of breech labor is good for the mother, as she need sustain no severe injury unless she has a contracted pelvis. On the contrary, such labor is dangerous for the child, because the cord may easily be pressed upon, causing asphyxia, and the child's throat and head be subject to serious pressure at the moment of delivery.

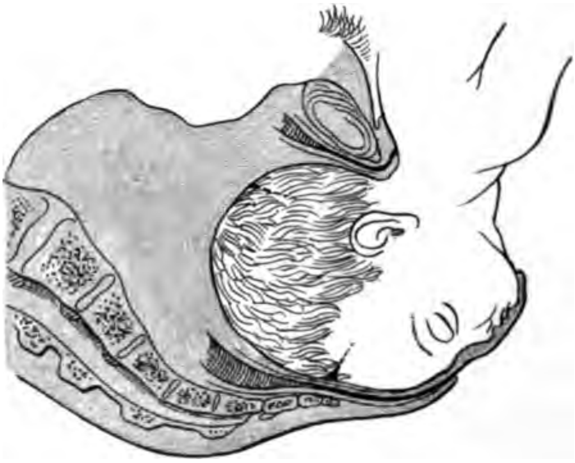
The child may sustain fracture of the clavicles or of the arms during delivery. If the head be delayed within the vagina and involuntary efforts at respiration occur, the child may inspire infectious material from the vagina and inspiration infectious pneumonia may result. If the head be large and be quickly and forcibly brought through the pelvis, fracture of cranial bones with extravasation of blood may occur. The delivery of a large child in breech presentation through a contracted pelvis usually results in the death of the child and in severely lacerating the tissues of the mother. As comparatively

FIG. 100.



Normal engagement of head. Breech presentation. (FARABOEUF and VARNIER.)

FIG. 101.

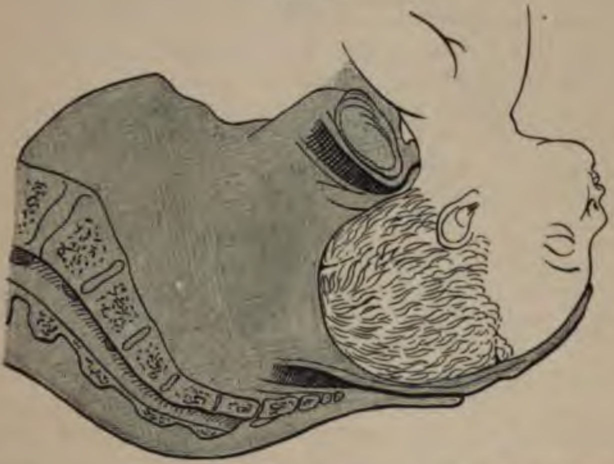


Normal birth of head. Breech presentation. (FARABOEUF and VARNIER.)

rapid delivery is necessary when the head of the child is upon the pelvic floor, laceration often occurs in these cases.

The prognosis for the mother in cases of labor with breech presentation skillfully conducted under antiseptic precautions is good, as lacerations of moderate extent only occur under such conditions. When these are promptly closed by suture a good result follows. The prognosis for the child is not so good, and a mortality ranging from 5 to 15 per cent. occurs in these cases.

FIG 102.



Normal expulsion of head. Breech presentation. (FARABOEUF and VARNIER.)

Treatment.—The treatment of breech labor consists in carefully preserving the membranes unbroken. The breech dilates the uterus more slowly than the head, and hence the membranes are more needed in breech labor than in normal cases. The first stage of these labors is often prolonged, as the patient does not usually make strong expulsive effort and dilatation is slow. Every precaution should be taken to avoid exhaustion, and rest must be procured, if necessary, by anodynes.

When the expulsion of the fœtus begins, its descent will often be more tardy than that of the head, and uterine contractions are frequently not so strong as in normal labor. The physician, while keeping himself informed of the progress of labor, should interfere as little as possible with the descent of the breech through the pelvis.

Care should be taken that the rectum of the patient is thoroughly emptied and that the bladder is emptied at frequent intervals.

If the uterine contractions are deficient, strychnia may be given or alcoholic stimulants, while rubbing the uterus and pressing the fœtus down are often useful. The physician must realize that at the moment when the shoulders and head are passing through the pelvis care must be taken to avoid delay if the life of the child is to be preserved. It is well to state to the friends of the patient that the labor is not a normal one, and that while the mother is not in especial danger, the life of the child will demand great care. Wherever it is possible, and especially in primigravidæ, the physician will do well to have an assistant at hand. In cases where expense is no object a second physician should be summoned, who will act as assistant to the obstetrician.

There should be in readiness forceps suitable for axis-traction, appliances for suturing the pelvic floor and perineum, and a small catheter for inflating the child's lungs, while a hot bath must be ready for the child, to assist in its resuscitation. Several hot towels should also be in readiness, with stimulants and hot and cold water. Although an anæsthetic is not always needed, it should be at hand, and chloroform will be found most useful.

When the hips of the child appear at the vulva the patient should be placed across the bed, her hips at the edge, her thighs flexed upon the abdomen, and her feet supported in two chairs or held by assistants. As the child emerges it is well to pass the fingers beneath the child's abdomen, to see whether a loop of cord has descended and is being pressed upon by the child. If this be the case, the loop should be brought with the fingers to that portion of the pelvis where there is greatest room. This is usually in the curve of the pelvic brim at one side of the promontory of the sacrum. The choice as to which of these points will be chosen must depend upon the circumstances of the case.

As the body of the child emerges it is well to wrap it in a warm towel to prevent efforts at breathing from the stimulus of the external air.

Birth of the Shoulders and Head.—When the body has been born to the shoulders the physician should bend the trunk of the child laterally, raising the hips toward the mother's abdomen and carrying the right shoulder of the child obliquely downward and forward. The right shoulder and arm will then be born into the vagina, while the left will pass beneath the pubic joint. Both elbows and shoulders often emerge from the vulva together. As the head comes upon the pelvic floor a slight delay occurs in labor. Pressure upon the perineum often sets up strong uterine contractions. The chin of the child sinks low upon the pelvic floor, while the head passes quickly over the perineum and through the vulva by strong flexion.

At this stage of breech labor the physician should grasp the child, wrapped in a warm towel, by the legs, and carry its body strongly upward over the mother's abdomen. With the other hand he should make strong pressure, laying his hand across the mother's abdomen just above the pubic joint.

In normal breech labor the head readily emerges with this manipulation.

The perineum and pelvic floor are often lacerated in breech labor, because the head must emerge so rapidly that no time is given for dilatation; but the laceration is seldom extreme unless undue force and haste are used in delivering the child.

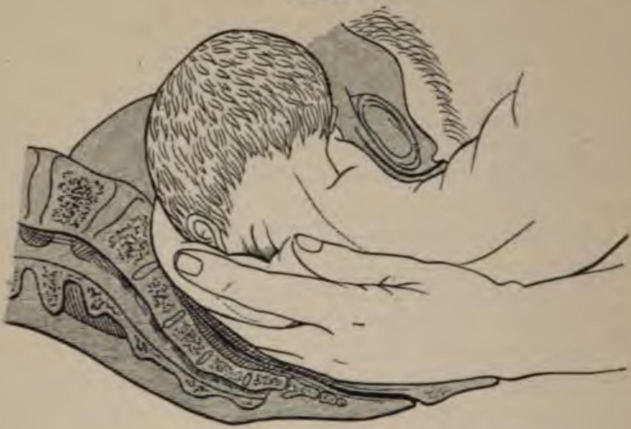
Delivery in Posterior Rotation of the Back.—Where the back of the child is turned toward the spinal column of the mother, the face of the child looking toward her abdomen, delivery is effected in a different manner from that already described. The body of the child may be rotated into its normal position if the physician detects the abnormality promptly, and makes pressure obliquely upon the child's hips. If, however, the body is not rotated, care must be taken not to make traction upon the hips, as the child's chin, which is anterior, may be easily drawn away from the chest and the head extended. The arms and shoulders are born as in cases where the back is anterior.

Flexion must be maintained and the head brought to descend until the chin is in the vulva and the forehead is beneath the pubic joint. The head will then pivot upon the forehead and the occiput pass out over the pelvic floor by flexion. In these cases it is advantageous to turn the mother upon her side, separating her thighs widely. The body of the child should be carried backward as the arms emerge, pressure being made upon the chin to prevent extension. When the forehead has reached the pubic joint the body may be carried strongly upward and forward, thus bringing the occiput over the pelvic floor.

Complications of Breech Labor and their Management.—Breech labor may be complicated by extension of the arms above the head and by extension of the head upon the trunk. Both of these complications arise from traction upon the trunk or from strong expulsive efforts on the part of the mother after the breech and legs have been born. These complications are dangerous to the child, because they delay labor and subject the child to pressure, and also because the treatment of these complications exposes the fœtal limbs to danger of fracture.

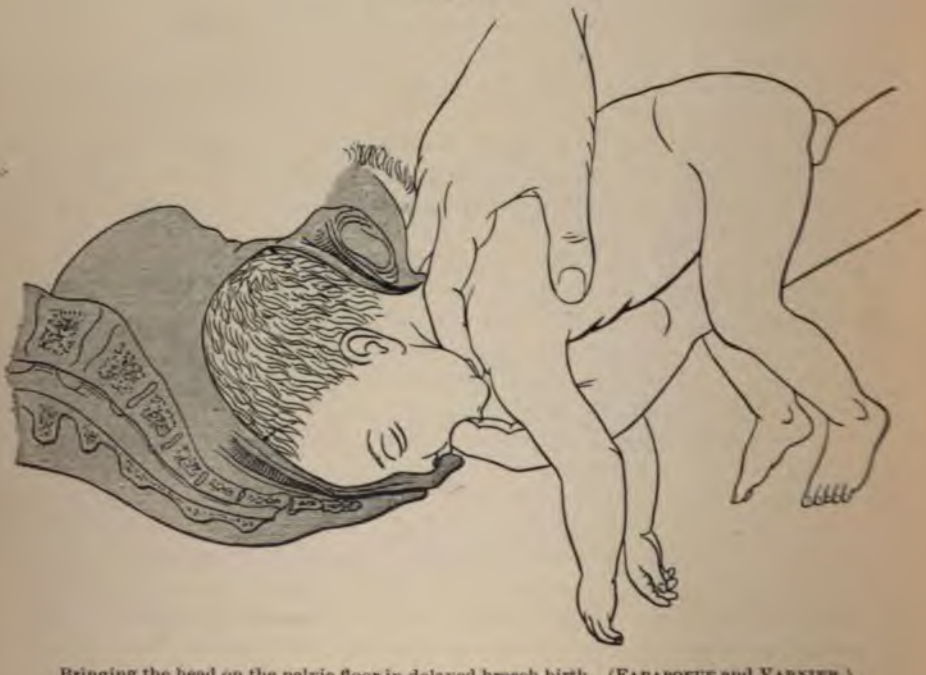
Two procedures are especially available in avoiding complications in breech labor. One is to make as little traction as possible upon the trunk, while the other consists in making pressure upon the uterus in following the child down from above during its birth. When the body has been born and the arms and elbows cannot be felt, the arms must be brought down by the following manipulation: If the mother is excessively sensitive and draws back at every effort to assist her, ether or chloroform should be given to obstetric anæsthesia. This can be readily done and will greatly assist the operator. The posterior shoulder and arm should be first brought down by gentle traction upon the hips. If this be the right, the feet and legs of the child should be grasped, wrapped in a towel, by the operator's left hand and traction made downward, the body of the child then being strongly raised obliquely toward the operator's left hand and the mother's right. The right hand of the operator should be laid upon the back of the child, with its palmar surface downward. Two or three fingers should be passed up upon the shoulder and upon the arm of the fœtus. Care should be taken to carry the fingers to the fœtal elbow, for, if this is not done, pressure upon the middle of the humerus may cause fracture. The arm should then be carried across the child's body and obliquely downward. The right hand of the operator should then grasp the feet and legs, and carry the child downward and obliquely backward to the opposite side. The fingers of the left hand should

FIG. 103.



Bringing down an arm. (FARABOEUF and VARNIER.)

FIG. 104.

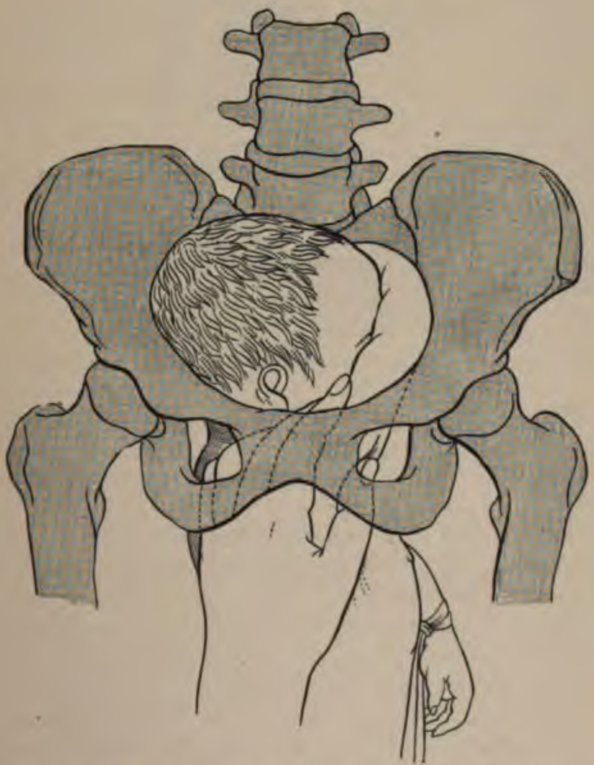


Bringing the head on the pelvic floor in delayed breech birth. (FARABOEUF and VARNIER.)

then be passed along the back and upon the arm to the elbow, thus bringing down the anterior or left arm.

When the arms have been brought down, if delay occurs in the birth of the head, the left arm and hand of the operator, being thoroughly aseptic, should support the child, which is astride the forearm, while the longest finger of the left hand is inserted into the child's mouth. The index and third fingers of the hand, the palmar surface being toward the child's chest, should be flexed upon the shoulders. The right hand of the operator should be laid transversely behind the mother's pubic joint. The left arm and hand should raise the body of the child and pull downward upon the lower jaw. At the same time the right hand should press strongly downward and backward in the axis of the pelvic cavity.

FIG. 105.

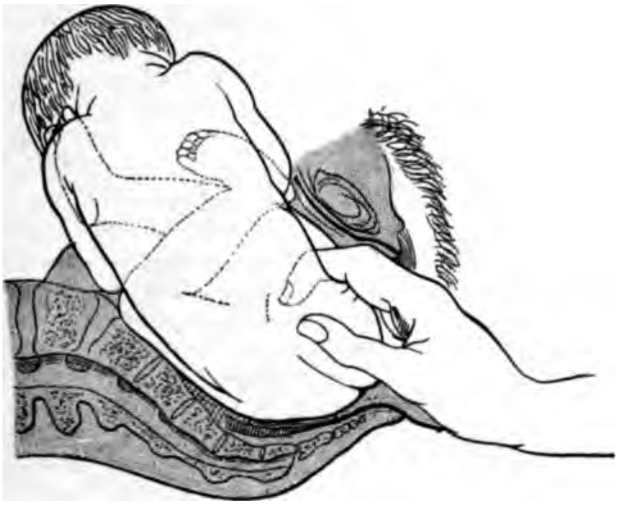


Dislodging an impacted arm. (FARABOEUF and VARNIER.)

It occasionally happens in the course of breech labor that complications arise by reason of an arm or leg which may be bent backward across the body or in front across the face of the child. When delay occurs in labor from these causes, if the legs and thighs be flexed upon the body of the child, the breech can usually be brought down by hooking a finger into the groin and making traction with the pains.

If undue force is avoided, no greater harm can come to the child than chafing of the skin, which soon heals. In cases where the arm is drawn upward and across the face, and where strong uterine contractions may have forced the child into the pelvis, anæsthesia by ether or chloroform should be carried sufficiently deeply to relax the uterus and enable the operator to carry the hand up and dislodge the arm.

FIG. 166.



Traction in the groin: delayed breech labor. (FARABOEUF and VARNIER.)

In cases where the legs are flexed upon the thighs and the trunk of the fœtus is forced into the pelvic brim like a wedge, the child must be dislodged by carrying the hand up and bringing down a leg and foot.

Forceps.—When the head cannot be delivered by this manipulation the forceps should be inserted and applied to the sides of the child's head and axis-traction should be made. As soon as flexion of the head occurs upon the pelvic floor the handles of the forceps must be strongly raised to bring the face over the perineum. If the head cannot be delivered by these means, it is probable that the pelvis is contracted or that the head is of unusual size; and in view of the fact that the life of the child can endure not longer than five or ten minutes after the birth of the body and the retention of the head, if these measures are unsuccessful, the mother will be best protected by craniotomy.

Many methods of delivery of the after-coming head are described, but those mentioned have borne the test of experience and are successful in the great majority of cases.

Footling Presentation.—Footling cases are those in which the feet and legs are born in advance of the breech. They do not necessarily occasion complications, although dilatation of the uterus may be slow because of the small size of the presenting part.

Advantages of Breech Presentation.—There can be no question that a child can be more rapidly extracted in breech presentation through a normal pelvis than in other presentations. The advantages of such delivery are that the only instrument employed is the hand, which is most successful of all. The fœtus emerges in such a manner that its smaller portion comes first, thus gradually dilating the birth-canal, while the head passes through the pelvis in a short time and usually under the direct control of the operator.

Morbidity of Breech Labor.—The disadvantages of breech labor are the dangers to which it exposes the child by reason of pressure. Fractures of fœtal legs and arms occurring in breech labor do not seriously affect the fœtus, as union is commonly obtained.

If haste is imperative, it is better to deliver a living fœtus with a broken arm than to fail in bringing down the arms and lose the life of the child.

Treatment of Fœtal Injury.—Should fracture of the arm or leg occur in hasty delivery, it will generally be found upon examination that such fracture is not complete, but that the ends of the bone are not forced through the periosteum, and that the fracture remains what is known as an incomplete or green-stick fracture. The treatment of these cases consists in accurately fitting to the part a light retention-splint and holding it in place by a light and elastic bandage. Brown pasteboard of moderate thickness or spongiopiline forms an excellent material for this purpose. Either may be readily cut to fit the part, dipped in hot water and softened, and then applied and bandaged with a cheesecloth or light flannel bandage. Sufficient cotton-padding should be used to make the splint thoroughly comfortable. To prevent excessive motion it is often best to fit a splint to the entire extremity of which the broken bone is a part. The bandage should not be applied too tightly; and if care be exercised, no injury to the child need be done. The results obtained in the treatment of these cases are usually very satisfactory. Union is usually obtained without deformity and with the preservation of functions.

In place of fracture of one of the long bones there may be present a separation of the epiphyses or even of the condyles. Such an injury is to be diagnosticated by careful palpation, by measuring and comparing the limbs, and by observing the impairment of function which often comes when the child attempts to move the joint nearest the site of the injury. The treatment of the condition is essentially that of fracture, care being taken to immobilize the joint near the seat of injury.

CHAPTER V.

LABOR IN MULTIPLE PREGNANCY.

We have already outlined in treating of multiple pregnancy some of the factors which determine the character of labor in these cases. The first stage of labor is not infrequently prolonged as the uterus is greatly distended and the uterine muscle contracts poorly. If polyhydramnios be present, uterine distention is much increased. Premature rupture of the membranes hastens labor in these cases, but exposes the children to greater risk through pressure of the partially dilated cervix.

A long first stage of laboı is frequently succeeded by a short second stage. As the children are below the average size, no obstacle arises from disproportion, but abnormal presentations and interlocking may make spontaneous labor impossible.

The risk of hemorrhage from partial separation of the placenta, from failure in uterine contractions and from syncope in the mother is much above the average; hence the third stage of labor in multiple pregnancy is one of especial danger.

Treatment.—The condition should be diagnosticated as early as possible. During the latter portion of pregnancy the mother should be put into the best possible general condition. In cases where the uterine muscle is especially weak, in addition to iron, arsenic, and bitter tonics, the mother may take small doses of nux vomica or strychnia during the latter months of pregnancy to advantage. Premature labor should be anticipated and the necessary preparations made.

During labor in multiple pregnancy the action of the uterine muscle should be carefully watched, and if the patient's local and general strength be failing, dilatation should be promoted by the use of elastic bags. When dilatation is complete labor should not be allowed to continue unduly, but delivery should be effected with reasonable promptness in the interests of mother and children. After the birth of the first child delay in the birth of the others should not be permitted.

Especial care is necessary in conducting the third stage of labor in multiple pregnancy. Partial separation of the placenta with hemorrhage calls for the prompt emptying of the uterus, followed by the use of the tampon of iodoform gauze. The hypodermatic use of stimulants, hypodermoclysis or intravenous transfusion, and all efficient means of stimulation must be in readiness and may be needed upon very brief notice.

Prognosis.—The prognosis of labor in multiple pregnancy for the mother will depend upon her general weakness or vigor and upon the care which she receives, especially during the third stage of labor. Under thorough antiseptic precautions and in careful hands the small size of the children makes labor in multiple pregnancy comparatively safe for the mother.

SECTION II.

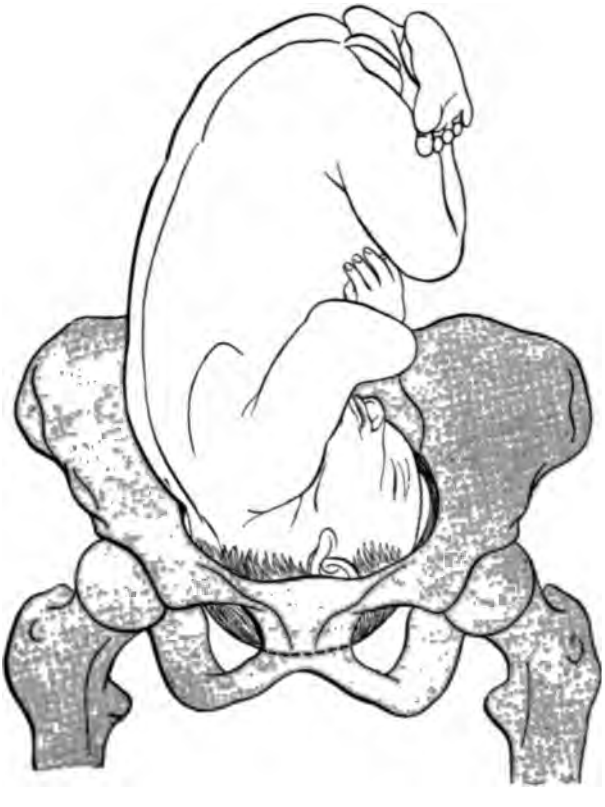
THE PATHOLOGY OF LABOR.

CHAPTER VI.

LABOR COMPLICATED BY ABNORMAL POSITION AND ROTATION OF THE VERTEX.

ALTHOUGH the vertex may present and labor-pains be good, and although the size of the mother's pelvis may be such as to permit normal labor, cases are seen in which the vertex fails to rotate to the

FIG. 107.



Vertex presentation, second position. (FARABOEUF and VARNIER.)

CHAPTER V.

LABOR IN MULTIPLE PREGNANCY.

We have already outlined in treating of multiple pregnancy some of the factors which determine the character of labor in these cases. The first stage of labor is not infrequently prolonged as the uterus is greatly distended and the uterine muscle contracts poorly. If polyhydramnios be present, uterine distention is much increased. Premature rupture of the membranes hastens labor in these cases, but exposes the children to greater risk through pressure of the partially dilated cervix.

A long first stage of labor is frequently succeeded by a short second stage. As the children are below the average size, no obstacle arises from disproportion, but abnormal presentations and interlocking may make spontaneous labor impossible.

The risk of hemorrhage from partial separation of the placenta, from failure in uterine contractions and from syncope in the mother is much above the average; hence the third stage of labor in multiple pregnancy is one of especial danger.

Treatment.—The condition should be diagnosticated as early as possible. During the latter portion of pregnancy the mother should be put into the best possible general condition. In cases where the uterine muscle is especially weak, in addition to iron, arsenic, and bitter tonics, the mother may take small doses of nux vomica or strychnia during the latter months of pregnancy to advantage. Premature labor should be anticipated and the necessary preparations made.

During labor in multiple pregnancy the action of the uterine muscle should be carefully watched, and if the patient's local and general strength be failing, dilatation should be promoted by the use of elastic bags. When dilatation is complete labor should not be allowed to continue unduly, but delivery should be effected with reasonable promptness in the interests of mother and children. After the birth of the first child delay in the birth of the others should not be permitted.

Especial care is necessary in conducting the third stage of labor in multiple pregnancy. Partial separation of the placenta with hemorrhage calls for the prompt emptying of the uterus, followed by the use of the tampon of iodoform gauze. The hypodermatic use of stimulants, hypodermoclysis or intravenous transfusion, and all efficient means of stimulation must be in readiness and may be needed upon very brief notice.

Prognosis.—The prognosis of labor in multiple pregnancy for the mother will depend upon her general weakness or vigor and upon the care which she receives, especially during the third stage of labor. Under thorough antiseptic precautions and in careful hands the small size of the children makes labor in multiple pregnancy comparatively safe for the mother.

SECTION II.

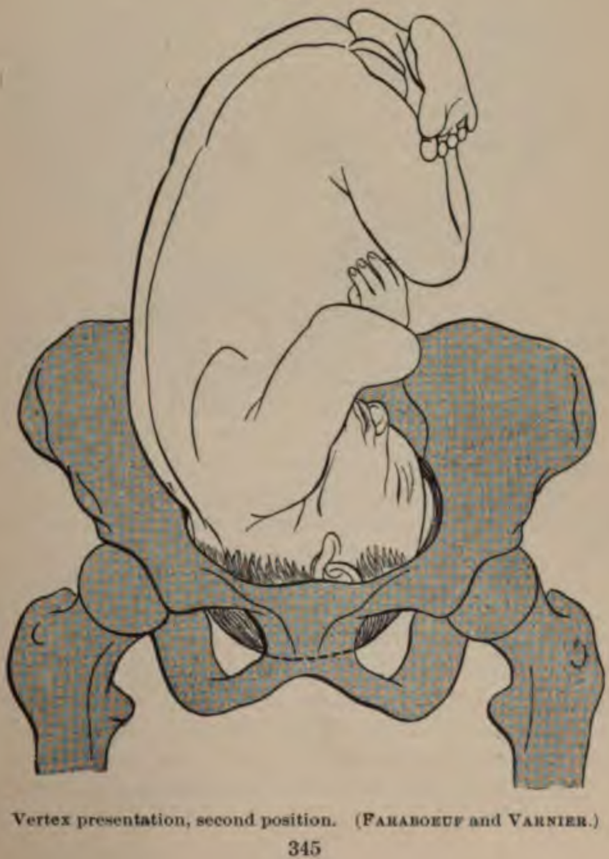
THE PATHOLOGY OF LABOR.

CHAPTER VI.

LABOR COMPLICATED BY ABNORMAL POSITION AND ROTATION OF THE VERTEX.

Although the vertex may present and labor-pains be good, and although the size of the mother's pelvis may be such as to permit normal labor, cases are seen in which the vertex fails to rotate to the

Fig. 107.

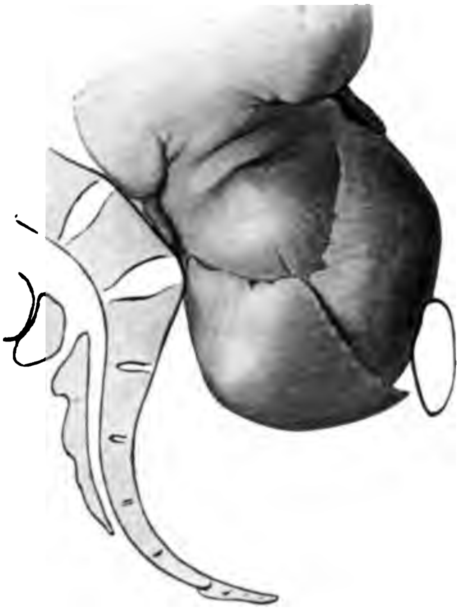


Vertex presentation, second position. (Farabœuf and Varnier.)

flexion of the head upon the trunk. This oblique position of the head upon the trunk is always present to some extent in labor when the head presents. It commonly, however, offers no obstruction to delivery, and is often not detected in normal labor.

Labor in Presentation of a Parietal Bone.—In the majority of cases it is the right parietal bone which presents. The course of labor in these cases is prolonged and more painful than usual. As the head fails to proceed into the pelvis, flexion becomes lost and the head lodges in the manner described. The uterine contractions often become stronger when an obstacle to delivery is present. Following the delay of the head, the patient may have strong pains which serve to force the head more fixedly in its abnormal position. If the head is not dislodged and labor allowed to proceed, the patient may become exhausted, the uterus is in a condition of tetany, and the death of the child may result through pressure. If labor pains continue, the lower segment of the uterus will become drawn out over the head and rupture of the womb may occur.

FIG. 118



Presentation of parietal bone in contracted pelvis. (BUMM.)

Treatment.—The treatment of this condition consists in making an early diagnosis by palpation. By internal examination it is evident that, to secure relief, the head must be dislodged from its abnormal position. The simplest procedure consists in pushing up the chin, causing flexion to become again established. This will convert the

position is present the presenting part is more apt, however, to turn posteriorly than in cases in which the first position is at hand.

It will be remembered that at the beginning of labor the vertex often occupies a position near the middle of the pelvic brim, being neither directly toward the pubic joint nor toward the sacrum.

When uterine contractions begin the occiput may descend, gradually turning behind instead of in front, until it reaches the pelvic floor behind the median line, transversely, of the pelvis. The cause of this abnormal rotation is a lack of proportion in size between the head of the child and the mother's pelvis. Failure in the head to flex perfectly also induces this abnormality. As the head descends the occiput finds most room on one side or the other of the promontory of the sacrum. The patient suffers more than usual as labor proceeds, because the large occiput is forced downward against the strongest and most unyielding portion of the pelvic floor. The first stage of labor is more prolonged and painful than usual, while the second stage is marked by greater suffering and by uterine contractions which seem less effective than in normal cases.

Diagnosis.—The physician will find, in palpating the abdomen, that he cannot distinguish the occiput in front, as in normal cases. The back of the child is less readily outlined, while the heart-sounds seem heard from a greater distance than normally.

On internal examination the vertex is found behind the median line of the pelvis, the smaller fontanelle being often so far back as to be difficult of access. The larger fontanelle may be more readily felt, which is the exact opposite of normal labor.

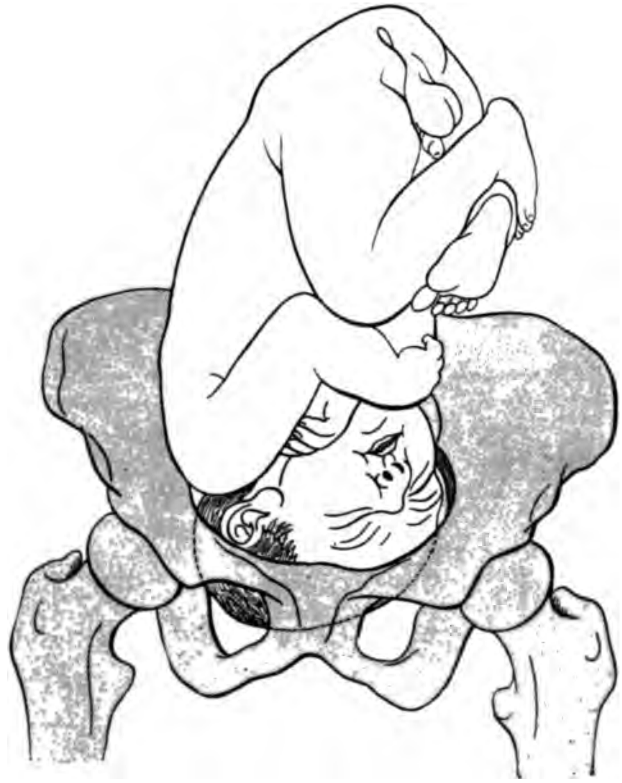
Factors Necessary for Anterior Rotation.—When the head descends upon the pelvic floor in labor three factors are always necessary to secure anterior rotation of the occiput—one consists in the fact that there must be no *great* disproportion between the head and the pelvis; the head must be well flexed and the expulsive forces of the mother must be good. There must also be an elastic and resisting pelvic floor. When these conditions are present and the occiput descends behind the median line of the pelvis, it may reach the pelvic floor without rotating. If, however, the greater part of the conditions are favorable for rotation, it may remain upon the pelvic floor for some time, but will finally turn to the front. Observation has shown that ninety-eight out of every hundred of these cases terminate by spontaneous rotation. When, however, the occiput remains upon the pelvic floor and rotation fails, if the pelvis is large enough to permit the birth of the child, the physician can supply those factors necessary for delivery which are lacking.

Treatment.—The management of these cases of abnormal rotation of the occiput depends upon the proper understanding of the condition.

If the physician observes that the head is descending through the pelvis, although progress may be slow, he should remember that spontaneous termination of labor is the rule, providing the patient's front, thus occasioning an abnormality of importance. Cases in which the back is directed toward the mother's right side, and in which the occiput turns to the front, occasion no abnormality in labor.

Posterior Rotation of the Occiput in Vertex Presentation, Second Position.—The position of the occiput and of the back when directed toward the mother's right side form what is called a second position. A first position is the usual one, the back and occiput being directed toward the mother's left side. The second position is that by which the back and the presenting part are directed toward the mother's right side. The mechanism of labor in the second position, the occiput presenting, differs from that of the first position only in the fact that the presenting part and the trunk of the fœtus rotate from right to left, instead of from left to right. The causes which produce rotation are the same, the phenomena of descent are the same; and in applying the forceps in such a case the operator must remember the reverse direction of rotation, but bear in mind that the mechanism is precisely that of the usual labor. In cases where the second

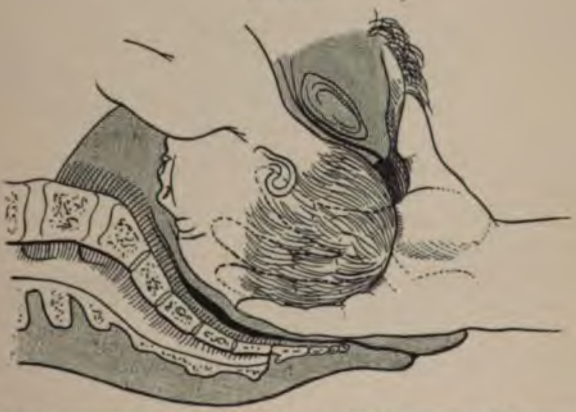
FIG. 108.



The most frequent posterior rotation of the occiput, vertex presentation, second position. (FARABOEUF and VARNIER.)

or to perform version, and for this purpose surgical anæsthesia is necessary. A competent assistant is most desirable, and ether should be given. The forceps best adapted to such a case are Simpson's. They should be fitted for axis-traction. We have found the use of tapes, as first suggested by Poullet, most successful in these cases. The bladder should be emptied by catheter, and, if the rectum is not empty, an injection must be given. The patient should be placed upon her back upon a table, although it is advantageous in some cases to have her lie upon her side. The vagina should be thoroughly cleansed with creolin or lysol, 2 per cent., and the patient anæsthetized. The physician must thoroughly cleanse his hands and make them aseptic in the manner described in treating of normal labor. He will require blunt-pointed scissors and instruments needed for sewing up the perineum and pelvic floor. These must be thoroughly sterilized by boiling in lysol, 1 per cent. Upon making an examination, the hand should be gently introduced within the vagina. The head must be grasped by the thumb and fingers, and a persistent but gentle effort made to turn the head so that the occiput shall go to the front. In some cases, with the patient under complete anæsthesia, this turn may be wholly or partially accomplished. If the physician can turn the head but a little, so that it remains obliquely in the pelvis, the occiput toward the front, he may then apply forceps while the head is in this position and proceed to deliver the child.

FIG. 109.



Manual correction of defective rotation. (FARABOEUF and VARNIER.)

Application of the Forceps.—In applying the forceps in cases of defective rotation, the aim of the physician should always be to fit them accurately upon the sides of the child's head. No effort should be made to rotate the head forcibly by forceps, for if the operator will content himself with making traction downward and backward in the pelvic axis, taking care to pull in the central line of the pelvis, he will find that the head and forceps will rotate without difficulty. The strength be sufficient. Such cases demand especial care to avoid exhaustion. The patient must be fed at regular intervals, stimulants being used with food if necessary, while fruitless efforts at straining and bearing down must be avoided.

Posterior Rotation: First Position.—While posterior rotation usually occurs in second positions with vertex presentation, this abnormality may be present in first positions also. It is produced by the same factors and is treated in the same manner as posterior rotation in the second position. In the experience of the writer, these cases occur frequently in primiparous patients with greatly relaxed pelvic floor and with feeble expulsive forces.

Posture.—The posture of the patient in these cases is of considerable importance. It has been found by observation that if the patient lies upon that side toward which the occiput is pointing, gravity causes the fundus of the uterus to fall toward the bed, thus rotating the lower portion of the womb and the head of the child in the opposite direction. If the occiput be found upon the left side of the patient's pelvis and behind, if she will lie upon her left side, her thighs flexed, the fundus of the womb will gravitate toward the bed on which she lies, while the head of the child will tend to move from left to right. Continuous pressure upon the abdomen over the fœtal back will also favor rotation. This, however, is rarely advisable, and is unnecessary if gravity be utilized. The membranes should not be ruptured, but preserved as long as possible, as the presence of the amniotic liquid assists in rotation. Care should be taken that the patient secures sufficient sleep during the first stage of labor. As long as the membranes are unbroken delay will harm neither mother nor child. If the pains are severe and exhausting, if the mother be given one-eighth of a grain of morphine with atropine, by injection, she will sleep several hours and awake much refreshed.

It is important in these cases that the bladder and rectum should be kept as empty as possible.

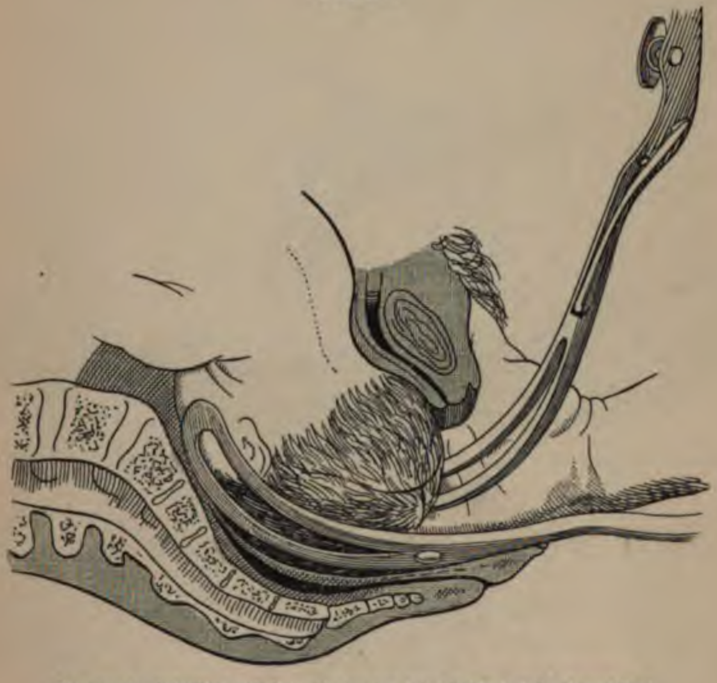
Treatment of the Second Stage of Labor.—When, however, the membranes break and the second stage of labor is well established, the patient will be the better for a tonic, taken with some form of nourishment. If the patient is accustomed to take tea or coffee, one of these may serve a useful purpose. A glass of good wine or a tablespoonful of brandy or whiskey taken alone or beaten up with a raw egg will be found of value. In cases with generally deficient nerve force tonic doses of strychnia may be used.

When the occiput turns to the front spontaneously rotation is usually attended by a very few strong contractions of the womb, which, occurring suddenly, rapidly change the position of the occiput.

Manual Rotation and Forceps.—When rotation has occurred, labor terminates in the usual manner. When, however, rotation does not occur and the patient's strength is inadequate to maintain good contractions of the womb, the physician must supply the missing factors and assist in completing labor. He should prepare to apply forceps patience, it will require but a few tractions to cause the head to rotate, when the forceps will be found to fit accurately upon the sides of the head.

If, however, the operator cannot turn the head, but finds that the occiput persistently rotates toward the sacrum, he must consider one of two courses of action. If the head is not firmly fixed in the pelvis, but can readily be carried up above the pelvic brim, he would be following the advice of excellent observers were he to perform podalic version. On the other hand, if the head be not very large and the mother's pelvis ample, he may choose to make traction upon the head and deliver the child, the occiput remaining behind. There is no question that such delivery is possible in many cases. The mother, however, will sustain laceration of the pelvic floor and perineum, while the child's head may be considerably bruised.

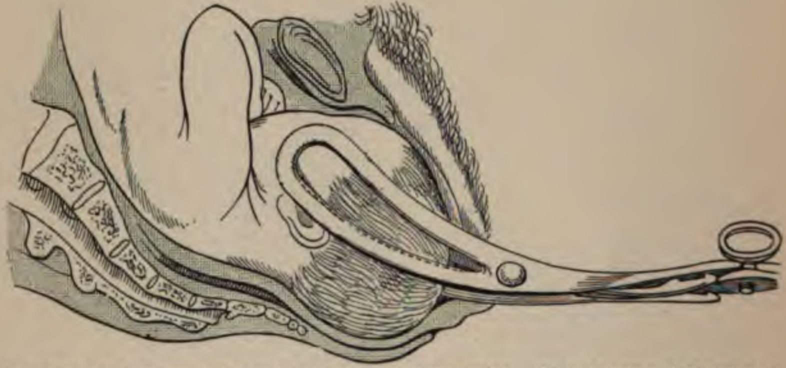
FIG. 112.



Forceps in defective rotation, the upper (right) blade introduced first.
(FARABOEUF and VARNIER.)

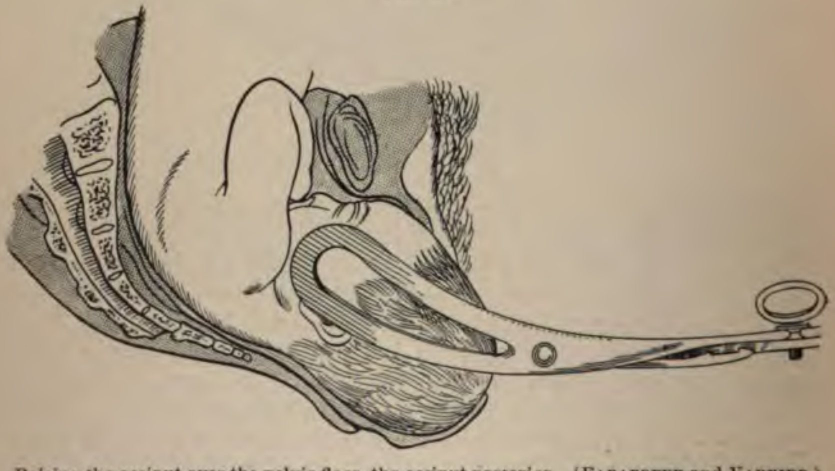
Forceps with the Head Obliquely.—In cases where the occiput can be brought but part way to the front by the hand, rotation can often be effected by applying the forceps to the sides of the pelvis without attempting to lock them completely, making a gentle traction in the pelvic axis and relaxing the grasp of the forceps between each traction. In this way the head is left for a period within the forceps, and in the majority of cases it will so rotate to the front. In cases where spontaneous rotation and expulsion do not occur, the most desirable method of treatment consists in anæsthetizing the patient, introducing the hand and turning the head of the child sufficiently to apply the forceps obliquely, with the occiput in front of the median line. The case may then be terminated as if the occiput had not turned behind. If, however, this is unsuccessful, the forceps must be applied to the sides of the pelvis and axis-traction made at intervals, the forceps being loosened between each traction, so that the head may rotate within the instrument.

FIG. 113.



Bringing the head upon the pelvic floor, occiput posterior. (FARABOEUF and VARNIER.)

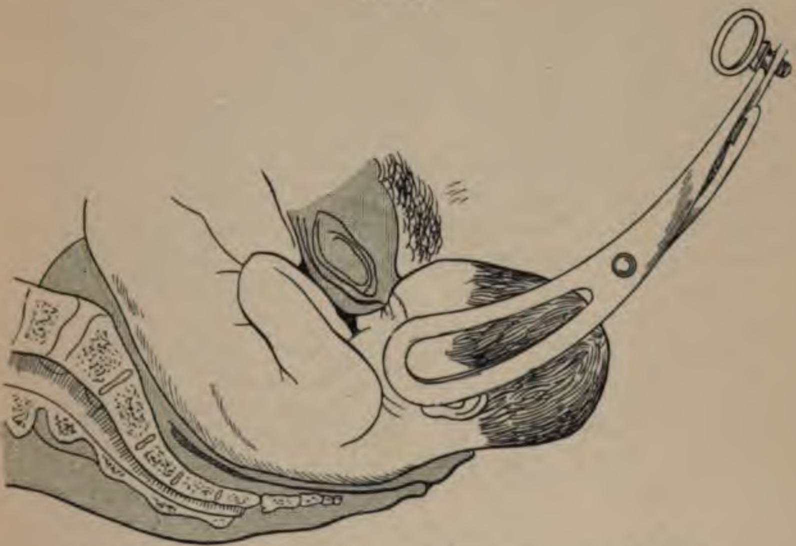
FIG. 114.



Raising the occiput over the pelvic floor, the occiput posterior. (FARABOEUF and VARNIER.)

Forceps with the Occiput Posterior.—If the occiput rotates behind, traction should be made with the forceps downward and directly toward the operator until the forehead of the child comes beneath the pubic joint. The forceps should then be relaxed, the handles lowered, and a new grasp upon the head taken. Traction should then be made downward until the forehead is well beneath the pubic joint, when the handles should be carefully raised and the occiput lifted over the perineum. An extensive tear may sometimes be prevented by double episiotomy.

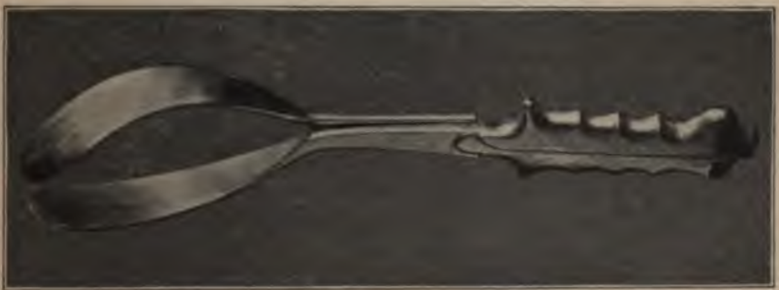
FIG. 115.



Birth of head by forceps, occiput posterior. (FARABOEUF and VARNIER.)

Rotation of the Head by Forceps.—It is sometimes possible to apply the forceps to the sides of the child's head and to rotate the head until the occiput is partly anterior. The best forceps for this purpose have solid blades, a long, narrow shank, and a slight pelvic curve. To perform this manipulation successfully, the position of the child should be carefully outlined by palpation and auscultation. The bladder and rectum should be emptied, and the patient should be com-

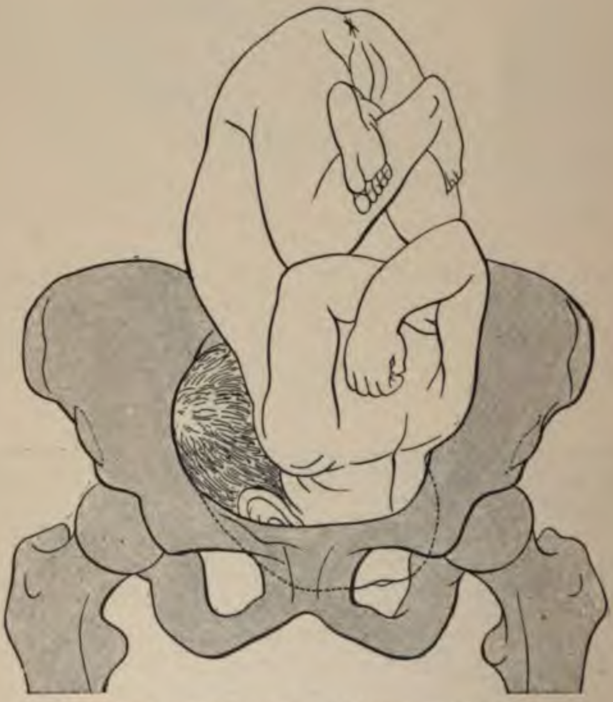
FIG. 116.



Tucker-McLean forceps for rotation of the head. (From original photograph.)

pletely anæsthetized. When the forceps is accurately applied to the sides of the head, the effort should be made to bring the occiput in front of the median line of the pelvis upon that side of the pelvis toward which the back of the child was originally directed; thus, if the position has been second, the rotation should be from the median line toward the patient's right side. If the position was originally first, the occiput rotated posteriorly, the effort should be made to turn it from the centre toward the left side. Rotation must be accomplished with as little force as possible, and when the head has reached the desired position the rotating forceps may be removed and another pair of forceps applied to the head and delivery effected. If the rotation of the head sets up strong uterine contractions, if the operator thinks wise, he may allow labor to terminate spontaneously. This manipulation is not one for beginners, and is unsafe in the hands of those who are not experienced operators with the forceps.

FIG. 117.



Head impacted, occiput posterior. (FARABOEUF and VARNIER.)

Rotation of the Body and Shoulders.—Attention has been called to delay in the delivery of these cases, caused by failure of rotation in the body and shoulders of the child. Failure of the body and shoulders of the child to rotate may arise from spasmodic contraction of the uterus, which may be in a condition of tetany, or from excessive size of the shoulders and body. Whatever may be the condition present, an effort should be made, under chloroform anæsthesia, to bring about a partial rotation of the trunk by manipulation. Care should be taken that the bladder is empty. The patient's thighs should be completely flexed and she should be anæsthetized, and the physician should grasp the trunk, having first accurately mapped it out by palpation, and endeavor to turn it in the desired direction. Gentle, persistent efforts, accomplishing but little at a time, but repeatedly, will often assist greatly in bringing about the desired turning. The uterus must be studied to detect the presence of distention of the lower uterine segment, and great care should be taken to avoid a rupture of the uterus. In performing this manipulation it is often of advantage to turn the patient upon the side toward which it is desired that the back and shoulders should turn. The force of gravity is thus brought to the aid of the manipulation, and progress is often made when otherwise nothing could be accomplished.

The uterus may grasp the trunk so firmly that delivery may be difficult without performing craniotomy, emptying the skull, and delivering the head with a cranioclast under complete anæsthesia.

Laceration in Occipito-Posterior Delivery.—In most cases in which the occiput is delivered behind, the pelvic floor will be torn to the rectum. Unless the patient suffers from collapse or shock, this injury should be at once repaired. In laceration which is extensive, it will be found advisable to suture the vagina with strong catgut, burying it in the tissues, or using the continuous suture. If the skin be broken, the tear should be closed with silkworm gut, and especially with buried chromicized catgut stitches which bring together any torn portion of the sphincter muscle of the bowel.

Injury to the Child.—The child's face, where delivery occurs without rotation, is often considerably bruised, the forehead, having been beneath the pubic joint, being especially injured. Although both eyes may be swollen shut, serious injury to the eyes is very rare. If strict cleanliness be maintained with applications of hot water, children recover, as a rule, without deformity.

Treatment of the Third Stage of Labor.—It will usually be necessary in these cases to remove the placenta manually, for the patient will usually lack spontaneous uterine contraction. Her risk of hemorrhage and septic infection is greater than in normal labor, and calls for greater care on the part of the attendant.

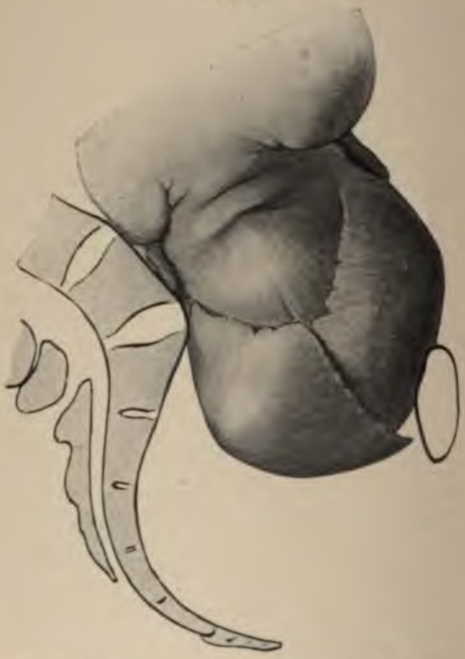
Presentation of a Parietal Bone. — Cases in which the head presents with one parietal bone at the centre of the pelvic cavity are termed parietal bone presentations. They are often seen in contracted pelves in which the head endeavors to enter the pelvis in the usual manner, and, failing in this, turns across the pelvis.

Diagnosis.—By palpation the physician will find the occiput upon one side of the entrance to the pelvis, while the chin and face are upon the other. In the centre of the pelvic cavity the parietal bone will be found, having rotated from above downward to the centre by lateral

flexion of the head upon the trunk. This oblique position of the head upon the trunk is always present to some extent in labor when the head presents. It commonly, however, offers no obstruction to delivery, and is often not detected in normal labor.

Labor in Presentation of a Parietal Bone.—In the majority of cases it is the right parietal bone which presents. The course of labor in these cases is prolonged and more painful than usual. As the head fails to proceed into the pelvis, flexion becomes lost and the head lodges in the manner described. The uterine contractions often become stronger when an obstacle to delivery is present. Following the delay of the head, the patient may have strong pains which serve to force the head more fixedly in its abnormal position. If the head is not dislodged and labor allowed to proceed, the patient may become exhausted, the uterus is in a condition of tetany, and the death of the child may result through pressure. If labor pains continue, the lower segment of the uterus will become drawn out over the head and rupture of the womb may occur.

FIG. 118.



Presentation of parietal bone in contracted pelvis. (BUMM.)

Treatment.—The treatment of this condition consists in making an early diagnosis by palpation. By internal examination it is evident that, to secure relief, the head must be dislodged from its abnormal position. The simplest procedure consists in pushing up the chin, causing flexion to become again established. This will convert the

presentation into a vertex and allow labor to proceed if the pelvis be not so contracted as to make it impossible. To accomplish this the patient must be anæsthetized with chloroform or ether, the vagina made aseptic, the hands of the obstetrician thoroughly scrubbed, and the patient placed upon a table. Axis-traction forceps must be at hand and asepticized. If the uterus is in a condition of tetanic contraction, chloroform is the better anæsthetic. The hand should then be introduced gently into the vagina and the head sufficiently grasped to estimate its size and its relations to the pelvis. By pressing up with the external hand upon the trunk of the child, the internal hand may also endeavor to dislodge the fœtus by pressing the chin upward. This should cause the vertex to descend into the pelvic cavity. If the patient's condition demands it, the forceps must be applied before the hand is removed and labor ended.

If this effort be unsuccessful, an effort may be made to convert the presentation into one of the face. To accomplish this the opposite manœuvre must be executed. The vertex must be pushed upward and the chin allowed to descend. By rotating the chin toward the front and stimulating labor pains, the patient's delivery may in some cases be effected.

In flat pelves, if the head can be dislodged, podalic version may be performed. This, however, will not be possible unless the uterus is relaxed and danger of uterine rupture be absent. For this procedure the use of chloroform is indicated. If the child be dead when the physician sees the case, and the uterus be firmly contracted upon the fœtus, no hesitation must be felt in doing craniotomy. After opening and washing out the head, delivery should be effected by the cranioclast.

In cases of contracted pelves, with parietal presentation of the fœtus, where pelvimetry, on examination, shows that labor is impossible in the normal way, if the child be living and strong, symphysiotomy or abdominal section should be performed.

Presentation of a Parietal Bone in Contracted Pelvis.—Presentations of the parietal bones are of significance as indicating probable pelvic contraction or an abnormal condition of the child's skull. They call for a critical examination of the case and a wise choice of treatment. Probably the greatest error which can be made in these cases is the indiscriminate application of forceps and the effort to direct the head into the pelvis by forceps without further preparation.

It is very easy to err in a diagnosis of fœtal engagement in the pelvis in presentations of a parietal bone, or for the inexperienced in cases of normal labor. If the pelvic floor be such that vaginal examination is easy, the finger of the examiner comes readily upon the vault of the cranium, and the physician, because of this fact, may decide wrongly that the head has engaged. To avoid error it is necessary that the position of the skull of the fœtus with reference to the pubes be carefully ascertained. The head is not engaged until its most dependent point is at the level of the lower edge of the pubic

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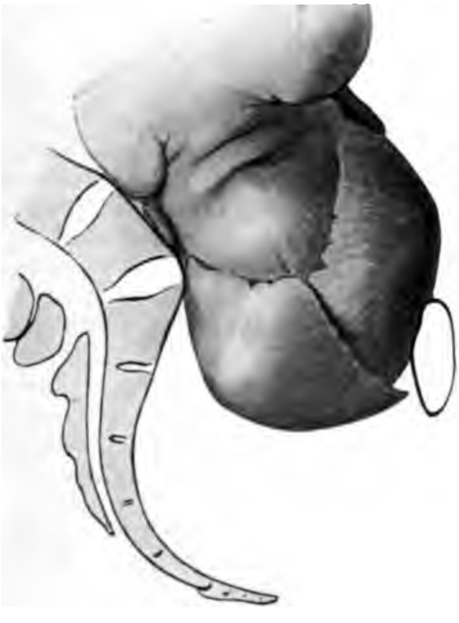

Presentation of parietal bone in contracted pelvis. (BUMM.)

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In cases of contracted pelves, with parietal presentation of the fœtus, where pelvimetry, on examination, shows that labor is impossible in the normal way, if the child be living and strong, symphysiotomy or abdominal section should be performed.

Presentation of a Parietal Bone in Contracted Pelvis.—Presentations of the parietal bones are of significance as indicating probable pelvic contraction or an abnormal condition of the child's skull. They call for a critical examination of the case and a wise choice of treatment. Probably the greatest error which can be made in these cases is the indiscriminate application of forceps and the effort to direct the head into the pelvis by forceps without further preparation.

It is very easy to err in a diagnosis of fœtal engagement in the pelvis in presentations of a parietal bone, or for the inexperienced in cases of normal labor. If the pelvic floor be such that vaginal examination is easy, the finger of the examiner comes readily upon the vault of the cranium, and the physician, because of this fact, may decide wrongly that the head has engaged. To avoid error it is necessary that the position of the skull of the fœtus with reference to the pubes be carefully ascertained. The head is not engaged until its most dependent point is at the level of the lower edge of the pubic joint. It is necessary, in studying the progress of labor, to note constantly the position of the vertex, or of the presenting part, with reference to the lower edge of the symphysis. In labor, in contracted pelvis, the presentation of the parietal bone often becomes exaggerated by lateral obliquity of the head, and this exaggeration or complete presentation of the parietal bone is mistaken for the gradual descent of the fœtus. This error can be readily avoided if the points stated are kept in mind in making a diagnosis. It is of great importance that a thorough examination be made in these cases, and, if the patient is nervous, restless, and resists examination from fear of pain, she should be wholly or partially anæsthetized and a thorough examination made. During this anæsthesia the physician may endeavor to fit the head of the fœtus into the pelvic brim by pressing downward upon the head behind the symphysis pubis. A few moments' trial will suffice to determine whether or not the head can engage.

Walcher's Position.—In ascertaining this fact it must be remembered that certain postures of the patient are much more favorable than others to secure descent and engagement. What is termed Walcher's position of the patient has been shown to favor, more than any other, the possible engagement of the head. This is obtained by bringing the patient to the edge of a bed or table, her hips projecting considerably over the support upon which she lies. Her thighs are extended and allowed to hang freely. In this way the pelvis is tilted downward and forward, and it has been found by observation that the pubes is put upon the stretch, and that a slight rotation of the two halves of the pelvis, with corresponding enlargement in the pelvic brim, takes place. With the patient in this position it may be possible to press the head down to the level of the lower border of the symphysis, and thus to bring about a virtual engagement. An inexperienced observer will decide that engagement is present when he can readily touch the head, but as this depends upon the length of the vagina, the rigidity of the pelvic floor, and often upon the posture of the patient, it will be seen that these are deceptive and misleading data upon which to base a judgment.

CHAPTER VII.

LABOR COMPLICATED BY ABNORMAL EXPULSION.

(ABNORMAL LABOR PAINS.)

Deficient Expulsion: Weak Labor Pains.—The term labor pains includes involuntary contractions of the uterus, supplemented by voluntary contractions of the abdominal muscles and all other accessory muscles. That these various groups of muscular tissues should act efficiently, several conditions must be present. Good muscular development is essential, while healthy nervous stimulus must also be present, with sufficient general strength on the part of the mother to maintain muscular activity. The most frequent deviation from this condition is to be found in weak labor pains or deficient expulsive force. These are most frequently seen in women of poor muscular development, with susceptible nervous systems and often impaired nutrition. Many of these are primigravidæ, and some of them are young.

The depressing effect of the emotions is often seen in delayed labor in cases where a profound mental shock seems to check completely action of the uterus. Among the most common cases of weak labor pains is excessive sensitiveness or susceptibility to suffering, which inhibits the muscular contraction of the uterus through its impression upon the cerebral centres. Exhaustion is always a cause of deficient labor pains, which must be promptly recognized.

Diagnosis.—The contrast between delayed labor from excessive sensitiveness and suffering, and weak pains from exhaustion, is best presented when the patient is given small doses of an anæsthetic. In cases where the dread of pain is delaying labor, as soon as suffering is relieved the contractions of the uterus begin and go on at regular intervals and with increased strength. On the other hand, if the patient is physically exhausted, the pulse will be rapid and weak, and a few whiffs of an anæsthetic will cause labor pains to cease entirely rather than to increase. The treatment of these two conditions must be radically different, and hence it is important that they be clearly recognized.

It is most important that the physician make a thorough examination to be sure that no mechanical obstacle exists to delivery. This is often impossible without a slight degree of anæsthesia. If ether, chloroform or bromide of ethyl be inhaled until sensation is partly destroyed, the size and position of the presenting part and the condition of the mother's birth-canal may be clearly ascertained. If exhaustion be present, the uterus will be found tightly contracted upon the child if the membranes have ruptured. The anæsthesia will have no further effect upon such a condition than to cause uterine contractions to cease entirely. If, however, the patient is simply prevented from having good pains by the sensation of suffering, under partial anæsthesia and the manipulation necessary in an examination uterine contractions will grow stronger.

During the use of the anæsthetic, the physician should accurately determine the position and presentation and the relative size of the child and pelvis. The pelvis should be palpated by a thorough but careful examination, and the internal antero-posterior diameter should be measured. Care must be taken to avoid the great error of allowing a patient to linger in labor whose pelvis is so contracted or whose child is so large that spontaneous parturition is impossible. This opportunity may also be utilized to endeavor to correct a lack of flexion or to promote the descent and rotation of the head by combining suprapubic pressure with vaginal manipulation. It should be remembered that the patient should be catheterized before such an examination.

Treatment.—The treatment of weak labor pains consists in giving the patient such general support and care as shall keep her in good general condition. She should not be allowed to become exhausted for lack of food or sleep. Her strength should not be wasted in fruitless efforts to bear down and expel the child. She should be kept in as comfortable a posture as possible, and everything done to sustain and comfort her.

If the membranes are unbroken and labor pains are deficient, sedatives may be employed to secure a proper action of the uterus or to give needed rest. To allay suffering from nervousness, chloral, bromides or codein is to be selected. If, however, the patient is exhausted and yet cannot sleep, morphine and atropine may be given by hypodermatic injection to advantage. It is well to give a stimulant, as whiskey or brandy, by rectal injections, combined with milk or egg, in these cases. If the patient can sleep several hours, she will recover her strength and labor will go on. In cases where exhaustion is but beginning and a tonic is required, alcohol in small doses or strychnia may be given as indicated. It is generally possible to give broth or milk, thus securing additional nourishment.

OPERATIVE TREATMENT.—If, however, the membranes have ruptured and labor pains are weak, while no obstacle exists to delivery, delay should not be prolonged. The head may be brought into the pelvis and well down within its cavity by external manipulation. If the uterus be rubbed at the fundus at regular intervals until it contracts, and then the head be pressed downward and backward at the brim of the pelvis by the hands of the physician, the head will be forced down within the pelvic cavity. When this has occurred and the head has reached the pelvic floor, the application of forceps may properly terminate the labor.

In cases where delay occurs through deficient dilatation of the cervix, the use of an artificial dilator is indicated. De Ribe's bag or some of its modifications is especially useful in these cases. The pressure of the bag excites uterine contractions, while its elasticity promotes the dilatation of the cervix. In cases complicated by hemorrhage from the cervix, a tampon of antiseptic gauze firmly packed within the cervix answers a useful purpose. Should an emergency arise requiring prompt dilatation and delivery, Bossi's dilator may be used. Should the operator decide to perform version, manual dilatation of the cervix will often be found the best method of procedure.

ANÆSTHETICS.—In cases where the membranes have ruptured, the patient not being at all exhausted but complaining greatly of suffering, an anæsthetic should be given, as indicated, to stimulate labor pains. For this purpose ether, chloroform, or bromide of ethyl may be used in small amounts at regular intervals. If the uterus be rubbed and a little chloroform inhaled, uterine contractions will become stronger and grow regular in these cases. Others prefer ether, giving it in small quantities continually until delivery occurs.

FORCEPS.—The reflex stimulation to uterine contractions resulting from pressure upon the pelvic floor may often be utilized in cases of delayed labor by bringing the head down upon the pelvic floor with forceps, removing the instrument, and allowing the birth to terminate spontaneously. For this purpose partial anæsthesia is required, and the inhalation of ether sufficient to enable the obstetrician to perform this manipulation assists greatly in terminating the labor. If done under antiseptic precautions and with skill, this use of the forceps is strictly justifiable, and does not add in the least to the morbidity or mortality of mother and child. The forceps in these cases is to be applied, if possible, to the sides of the head; but if this cannot be done because of the failure of rotation, if the forceps be applied to the sides of the pelvis and gentle traction be made in the axis of the pelvis, rotation will readily occur and the head will descend upon the pelvic floor in its usual position.

Excessive Expulsion (Violent Labor Pains).—Cases are occasionally seen in which uterine contractions are so violent as to complicate labor. These occur in strong and muscular women, and are often seen in cases where the child is large and exceedingly well developed. The management of these patients requires that they be made to lie down as soon as the membranes rupture. In normal cases the patient should lie upon her left side, flexing her thighs to avoid bracing herself with her feet. She should also discontinue any efforts at straining, and should breathe with the mouth open. Here, again, an anæsthetic is of great use in enabling the physician to control the progress of labor. As labor proceeds it may be advisable to apply forceps and maintain strong flexion of the head to avoid rapid birth, with partial extension. Excessively strong pains may injure the mother by tearing her and harm the child by bruising it.

Where uterine contractions are excessively strong and the mother is almost unmanageable through pain, the physician can best control the case by turning the patient upon her left side, flexing her thighs, giving an anæsthetic as rapidly as possible, and placing one hand over the vulva and the other above it and holding strongly upward and backward. This does not require the insertion of the finger into the vagina, and so does not expose the patient to the risk of infection. As soon as partial anæsthesia is obtained, time is given to govern the expulsion of the head and to secure the proper mechanism of labor.

Rigidity of the Birth-Canal.—Rigidity of the soft tissues of the birth-canal may furnish a serious obstacle to labor. A very long and narrow cervix, with strongly resisting tissue at the internal os, may delay the birth of the child for hours. A strong pelvic floor and tight perineum may also render birth very difficult. In these cases it must be remembered that the muscular tissues of these parts are directly under nervous control. Spasmodic contraction of the fibres about the os may be relaxed by the use of a sedative addressed to the nervous system.

The following formulæ have been found useful in these cases:

Hydrate of chloral	grs. 30.
Warm milk Warm water	each ℥ 2.

To be given by rectal injection.

Also:

Aqueous extract of opium	gr. 1.
Extract of belladonna	gr. ⅓.
Iodol.	grs. 5.

Cocoa-butter sufficient to make two rectal suppositories.

One of these to be inserted as soon as received, the other four hours afterward if needed. Sulphate or phosphate of codein may also be used by the mouth or by hypodermatic injection, in doses of one-fourth of a grain, repeated, if necessary, in two hours.

When, however, structural changes have made the tissues denser than normal, mechanical forces must be brought to bear to stretch them. Some have found benefit in repeated hot douches to soften the tissues of the birth-canal. In other cases stretching the parts with the fingers, followed by the insertion of an elastic bag (Barnes', McLean's, or de Ribe's), has given good results. Bossi's dilator may also be employed, but with increased risk of lacerating the cervix. When, however, the obstacle to delivery cannot be overcome by these means, the case should be treated by incision under antiseptic precautions. Where the obstacle lies at the external os, it is usually sufficient to make from four to six short incisions around the edge of the os with a probe-pointed bistoury. These cuts are but nicks in the tissues, yet often produce most favorable results.

The Forceps.—Where the pelvic floor and perineum are unyielding, the head may be brought down upon the pelvic floor by forceps, the patient being under an anæsthetic. Double episiotomy may then be made and the head delivered with forceps. The incisions should be immediately closed with continuous or interrupted suture. In dilating the pelvic floor and perineum with the presenting part, care should be taken to make very gentle traction and to push back the head after each traction. If the forceps is applied to the sides of the head, flexion can be maintained in this way to greater advantage than by manipulation with the hand. If the head is delivered very slowly, relaxing the grasp of the forceps between each traction, injury to mother and child is avoided and a favorable delivery is usually possible. Some prefer to bring the head down upon the pelvic floor with forceps and then remove the instrument, allowing birth to occur without it. While this course results well in many cases, in patients with whom the parts have been rigid and unyielding the presence of the head upon the pelvic floor sometimes sets up spasmodic and strong expulsive efforts, the result being to force the head over the pelvic floor and through the vagina before sufficient time for dilatation has elapsed. This is prevented if the head is delivered with forceps when it is under the absolute control of the operator.

Incision of the Cervix.—It occasionally happens that the cervix must be completely incised to secure rapid dilatation. This may be done by the use of blunt-pointed angular scissors, with which four cuts may be made, extending to the internal os. Under strict antisepsis, the incision of the cervix is a most efficient method, and should be followed by no bad results.

Complications Arising from Abnormal Expulsion.—Delay in labor, from whatever cause, exposes the mother to exhaustion, hemorrhage, and septic infection. The decision to interfere in delayed labor must be based upon a thorough study of the case and a correct appreciation of the cause producing the delay. Rigidity of the birth-canal and threatened exhaustion are causes readily controlled by operative interference. Under antiseptic precautions the operative treatment necessary for these conditions gives good results for mother and child.

Cases where some element which renders vaginal delivery exceedingly dangerous or impossible is overlooked result in a high rate of morbidity and a considerable mortality rate for the mother. The mortality for the children in these cases is very large.

The importance of an accurate diagnosis cannot be exaggerated in dealing with these patients. The physician must assure himself that he is not waiting uselessly, with an obstetric disaster as the result of his delay. On the other hand, if only excessive nervousness or moderate rigidity of the birth-canal be present, operative interference is not indicated, but simple treatment in the hands of a good nurse is quite sufficient.

CHAPTER VIII.

LABOR COMPLICATED BY DISPROPORTION BETWEEN PELVIS AND FŒTUS.

ONE of the most deceptive complications in labor is disproportion between the head of the child or its body and the pelvis of the mother. Measurements may show that the mother's pelvis is normal in size, and hence the obstetrician anticipates no especial difficulty in labor. If the patient has borne a child previously, there may be no history of complicated labor. If the abdominal wall be thick, palpation may give no adequate idea of the size of the head, and hence afford no warning of difficulty in labor. The usual history of such cases is that the mother has been exceedingly well during pregnancy, and that her appetite and strength have been excellent. The first stage of labor is usually prolonged, and the head is still in the pelvic brim. Labor pains gradually lose strength and vigor, the membranes rupture, but no progress is made. Mother and child show signs of exhaustion, and it is evident that assistance is required.

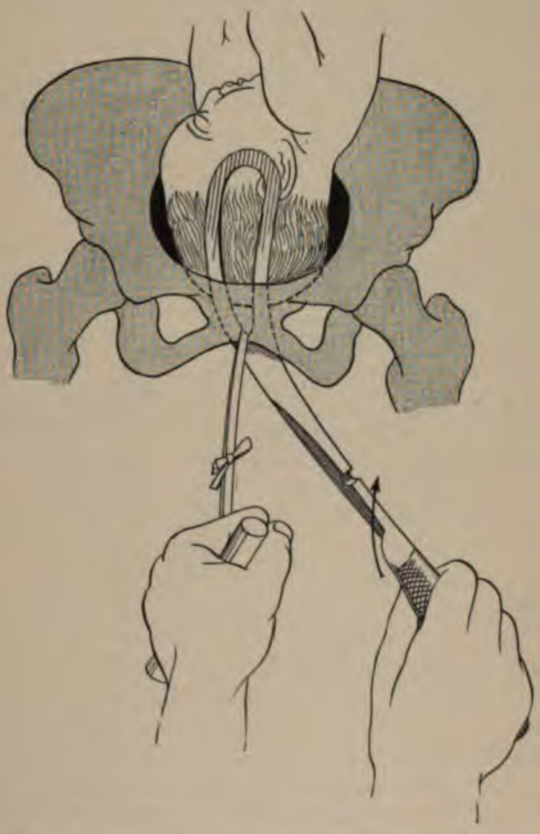
Fœtal Pressure.—In order to understand the course of these cases, it is necessary to consider the mechanism by which the head is moulded to the pelvis in normal labor. As uterine contractions force the head down, the resistance of the pelvic brim compresses the vertex, causing the sutures to override and forcing cerebro-spinal fluid from the brain into the membranes of the cord. The width of the fœtal cranium is diminished by the slipping of one parietal bone beneath the other, while the depth of the cranium is very largely increased. The antero-posterior diameter of the fœtal head may also be lessened by the forcing of the occipital bone beneath the two parietals. So perfect is the arrangement of the skull that a very considerable degree of pressure may be sustained in normal cases. Various measurements have been made to determine the extent to which the various diameters of the skull may be lessened by pressure during labor without positive injury to the brain. While these investigations are of great interest, they, unfortunately, give us no practical data by which to estimate the degree of compression to which the head is subjected. When the caput-succedaneum increases continually, the sutures override, and the head fails to advance, dangerous compression is going on. The effect of such compression is intra-cerebral hemorrhage. One of the sinuses of the brain may be ruptured or small bloodvessels may be torn within the brain, the lesion resulting in the pouring out of the blood into the brain tissue. If such hemorrhage covers a considerable area of the brain, its results are fatal.

In some cases nature overcomes this disproportion between head and pelvis by prolonged and vigorous labor pains, which mould the head and finally force it through the pelvis. When the head emerges after such labor, it is drawn out and the occipito-mental diameter is greatly increased. As long, however, as the pressure has been equally distributed upon the head, and hemorrhage has not occurred into the brain, the child may live, although it is greatly distorted.

Diagnosis.—The diagnosis of cases of labor in which the head is disproportionately large requires a very careful estimate of the possibility of delivery by the natural passage. Errors are usually made in diagnosticating the presence or absence of engagement of the head. Physicians may find one parietal bone projecting downward, and may mistake its convexity for the entire vertex of the skull. No more dangerous mistake can be made, because the presentation of the parietal bone is itself an indication that the head cannot pass normally through the pelvis. The value of partial anæsthesia in these cases is very great, as it enables the physician to make an accurate diagnosis. By putting the patient wholly or partially to sleep and introducing enough of the hand to palpate the head thoroughly, the physician can observe whether the head has really entered the brim of the pelvis or whether it has failed to engage but is rotating laterally, and a parietal bone is brought down. If the head has engaged and the indications for delivery are positive, the forceps should be applied. If, however, the head has not engaged, and suprapubic manipulation fails to bring it into the brim of the pelvis, measures must be taken to enlarge the pelvic brim or to lessen the size of the fœtal head, or to deliver the fœtus by abdominal and uterine incision.

Forceps.—In the first of these cases successful delivery can only be secured by making traction in the axis of the pelvis, hence axis-traction forceps is especially indicated. The forceps should be applied securely to the sides of the child's head, care being taken that the points of the blades do not press upon its neck or throat. Tarnier's forceps is especially adapted for delivery in these cases, and usually proves most efficient. Simpson's forceps with axis-traction tapes also gives excellent results in delivery with these patients. It is an advantage in some cases to turn the patient upon her left side, which permits better traction in the axis of the pelvis. Ether is the preferable anæsthetic, as it stimulates uterine contractions. As the child suffers from artificial delivery in these cases, it is well to have means for resuscitating it at hand. Hot and cold water, stimulants, and, if possible, an electric battery should be in readiness. The operator must be prepared to perform double episiotomy, in order that the child may be readily delivered with as little danger to the mother as

FIG 119.

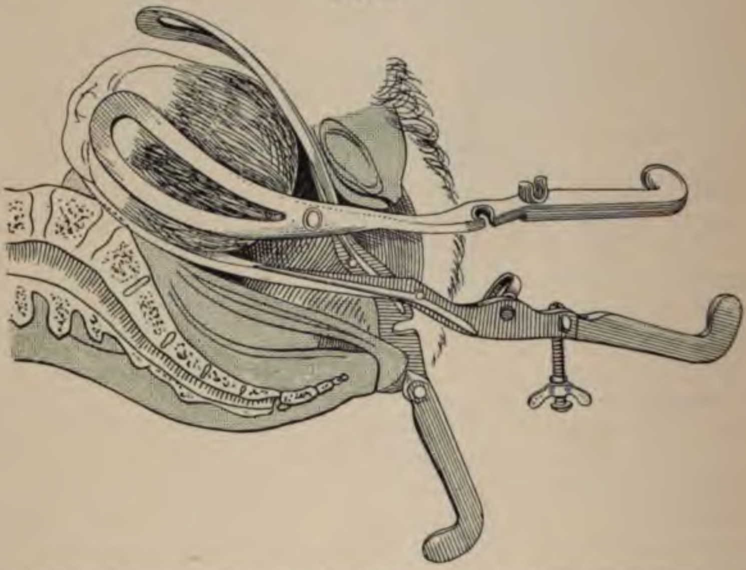


Illustrating axis-traction at the pelvic brim. (FARABOEUF and VARNIER.)

possible. While delivery should be effected as promptly as possible, traction should be made with the pains, and undue pressure with the forceps upon the head must be avoided.

Prognosis in Forceps Delivery.—Prognosis in these cases for the mother and child is good if the head can engage in the brim of the pelvis. Patience and accurate adjustment of the forceps are essential in the interests of the mother and child. In using Simpson's forceps it is well to relax their grasp between the tractions, thus interrupting pressure upon the head. In some cases, although apparent engagement is present when the operator makes traction, he finds that he cannot cause the child to descend. He must then desist from the use of forceps and choose some other method of delivery. In cases where the fœtus is larger than the pelvis, if the child presents by the breech, it will be exposed to great danger at the moment of parturition. The passage of a large head through the pelvis in such a case causes severe pressure upon the fœtal brain, with resulting intracranial hemorrhage, while, if the delivery is difficult, the force necessary to extract the fœtus may cause fracture of the skull by bringing the head violently against the promontory of the sacrum. Pressure upon the cord during prolonged labor in such a case may readily cause fœtal death through asphyxia. The mother will be liable to laceration of the pelvic floor through the excessive size of the fœtus and the efforts which must be made to assist its delivery. Great difficulty is sometimes experienced in these cases in extracting the shoulders by reason

FIG. 120.



Rotating the upper right forceps blade into position; head in the pelvic brim. (FARABOEUF and VARNIER.)

of their large size. One or both clavicles may be fractured by such a birth. This accident, however, is not a serious one so far as the life of the child is concerned, and the fœtus usually recovers from such a fracture without noticeable deformity.

Treatment.—The conduct of labor where an excessively large fœtus presents in breech presentation requires careful attention. The membranes should be retained unbroken as long as possible to secure complete dilatation. Traction should be avoided upon the breech or legs of the child, lest the arms become unfolded from the trunk. The extraction of the shoulders must be done in the usual manner, care being taken to rotate the bisacromial diameter of the fœtal body into one of the oblique diameters of the pelvic brim. The head of the child must be followed down as the body emerges by pressure upon the uterus, that complete flexion may be preserved. When the birth of the head occurs, Simpson's forceps with tapes should be ready, and if the first efforts at extraction fail the forceps should be promptly applied to the sides of the pelvis and traction made in the axis of the pelvis, while external pressure is continued behind the pubes. If delivery cannot be accomplished by these methods, the operator must perform craniotomy or open the pubic joint. The wishes of the parents must be ascertained before the actual birth occurs, so that the operator may be free to do what is required or may understand the limits which the case imposes upon him. If the child be living and in good condition, Walcher's position may be utilized, or symphysiotomy, if the patient be a multipara, offers an excellent chance, if done promptly and under antiseptic precautions, to save the lives of mother and child.

Face Presentation with Disproportion.—The difficulties of labor when the fœtus is disproportionately large are increased by the development of a face presentation. From the fact that in face presentations the long diameters of the fœtal head are constantly brought to present in the pelvis, the mechanism of labor is unusually prolonged, while its difficulties are greatly enhanced. As long as the chin can be brought to rotate anteriorly, hope of successful delivery through the vagina should not be abandoned. It will frequently be necessary in these cases to bring the head over the pelvic floor with forceps, and if the head be large a severe laceration of the pelvic floor is almost inevitable. Should the fœtal head become impacted and the chin turned behind, symphysiotomy or abdominal section offers the only hope of securing a living child. Craniotomy in such a case is often more difficult and dangerous to the mother than delivery by symphysiotomy or Cæsarean operation. As soon as a diagnosis is made in such a case, the physician should obtain a clear understanding with the husband of the patient and hold himself in readiness to interfere at any time with such operative procedure as the case may demand. The dangerous feature of such labor is the fact that unless the attending physician is skilled in diagnosis he will not recognize the abnormal size of the fœtus, and sometimes its abnormal presentation, until the patient has become partially exhausted and the child has been subjected for some time to injurious pressure. Version in face presentations where the fetus is excessively large is a dangerous procedure, because the great size of the child renders rupture of the uterus especially likely.

Brow or Parietal Bone Presentation with Disproportion.—When an abnormally large fetus presents in brow or parietal presentation, the case demands radical interference. Efforts to correct the presentation by bringing down the vertex or the face often fail in these cases. The use of forceps is contraindicated, and the operator has the choice of symphysiotomy or abdominal incision. Cæsarean section with suture of the uterus (celiohysterotomy) will often enable the physician to extract a living child with the least damage and danger to the mother and fetus. Craniotomy should be selected if the child is dead or is likely to die during labor.

Transverse Position with Disproportion.—When an excessively large fetus occupies a transverse position, presenting by the shoulder, version requires more than usual caution to avoid injury to the womb. Gentle manipulation is absolutely necessary, with a very gradual extraction of the hips and trunk. The difficulties already enumerated in the delivery of a large fetus by breech presentation will be experienced in these cases.

The Enlargement of the Pelvis: Walcher's Position.—In cases where the head does not engage in the pelvic brim, one of several procedures may be tried to enlarge the pelvis. The simplest of these is that known as Walcher's position. This consists in placing the patient upon her back at the edge of a table, her hips projecting over the edge of the support on which she lies. The limbs are allowed to fall downward toward the floor in an extended position. The effect of this manœuvre is to rotate the two halves of the pelvis forward and slightly outward upon the sacro-iliac joints. In young patients in whom the tissues are elastic sufficient increase in the size of the pelvis is thus obtained to make a practical difference in the course of labor. As the tendency of the patient is to slip off from the table, it will be necessary to support her body in this position. This may be done with the assistance of nurses, or by passing a broad, soft band, like a folded sheet, across the chest or across the back and over the shoulders beneath the axillæ. A few strong labor pains with suprapubic pressure will often cause the head partially to engage with this manipulation.

The Sitting Posture.—It is often of advantage in these cases to place the patient in a sitting posture upon a hollow support, like the rim of a bucket or of a large earthen jar. The thighs should be rotated outward, while the trunk of the body may be sustained by placing both hands upon a fixed object at a convenient distance. If the attendant will then sit beside the patient and pass his arms about her waist, he may make pressure upon the head above the pelvic brim with his hands, one upon each side of the head, and thus bring the head downward and backward into the pelvic brim.

Symphysiotomy or Pubiotomy.—In cases where manipulation fails, when aided by posture, to bring the head into the pelvic brim, the pelvis should be enlarged by operative procedure. The pubic joint may be opened or the ramus of the pubes may be severed. The simpler operation, symphysiotomy, gives excellent results in a certain class of cases. Experience has shown that while the operation itself is not difficult from a surgical standpoint, yet that injuries to the birth-canal may occur during delivery, the results of which may seriously affect the patient's health and even endanger her life. In cases where the vulva and vagina are small and imperfectly developed, the delivery of the head after symphysiotomy is likely to bring the tissues in the anterior vaginal wall against the cut ends of the pubic joint and produce laceration. This injury may be followed by infection, and septic poison may gain a ready access to the peritoneal cavity. In cases, therefore, where the birth-canal is poorly developed it may be necessary to perform extensive episiotomy or to select a method of delivery by abdominal section.

CHOICE OF OPERATION.—The physician cannot make an accurate judgment in the case unless he considers not only the physical condition present, but also the circumstances of the patient's life and surroundings. If she be a married woman in comfortable circumstances, to whom the life of offspring is valuable, and whose future good health is essential for her family, it may be better to accomplish delivery by abdominal incision, followed by suture of the uterus. If, on the contrary, she has some constitutional disease or pelvic condition, making parturition difficult, and requests sterilization, then it may be better to extract the child by abdominal incision, performing hysterectomy afterward. If the parents deliberately choose to expose the mother to no risk, but to sacrifice the child, embryotomy must be performed or the physician must retire from the case in favor of someone else. Cases are rare, however, among the well-to-do in which it is necessary to perform a radical operation.

The success which attends surgical delivery is such, however, that as soon as it is found that the head cannot engage without enlarging the pelvis an operation should be promptly performed.

FŒTAL MORTALITY.—The mortality among children delivered in these cases will depend upon the skill and good judgment shown by the operator in charge. Symphysiotomy in proper cases will save the life of the child, while a similar result attends abdominal section in the majority of cases. The greatest cause for fœtal mortality with these patients is error in diagnosis, through which the physician in attendance allows the child to be subjected to long-continued pressure or destroys its life by fruitless efforts at delivery with forceps. If the membranes are retained unbroken as long as possible, the chance for life of the fœtus is greatly improved.

MATERNAL MORTALITY.—The same causes which injure the life of the child threaten the mother's recovery. The majority of women who die after labor in these cases perish not from delivery, but from delay, which brings about exhaustion or sepsis, complicating a tardy operation. The question of the mother's life may often turn upon promptness in choosing the method of delivery and in carrying it out.

In cases where the child is excessively large, if the mother receives no assistance in labor, the fœtus dies during parturition from long-continued pressure, the mother's strength gradually fails, the uterus passes from a condition of tetanus to the relaxation of exhaustion and septic infection, the fœtus becomes infected, while long-continued pressure upon the neck of the uterus may bring about necrosis and fistulæ. A patient may survive in such a condition for several days, ultimately perishing of exhaustion and infection. If the dead child be removed and the septic uterus cleansed or also removed, recovery occasionally follows.

CHAPTER IX.

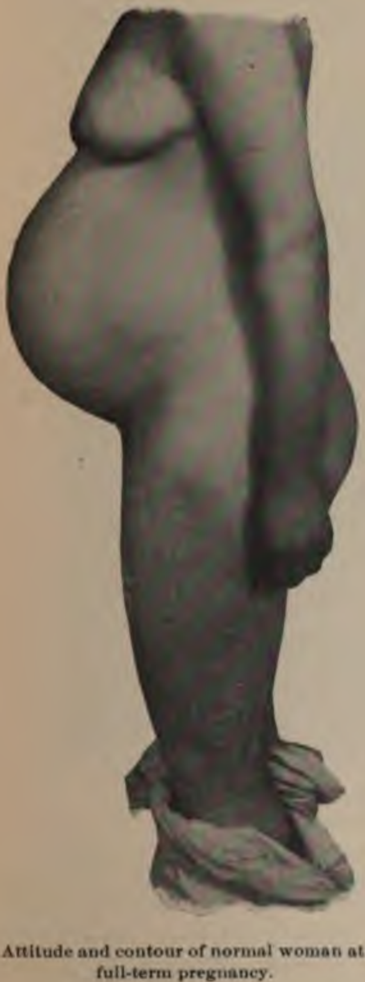
LABOR IN CONTRACTED PELVES.

Frequency.—The records of European clinics show wide variation in the percentages of contracted pelves observed. This difference extends from the reports of Russian clinics, giving 1.2 per cent. of contracted pelves, to the statistics of Leopold at Dresden, who found 24.3 per cent. of pelvic contraction. Such difference may be largely accounted for by varying methods of examination, and to some extent by racial differences in the development of the skeleton. American observers have reported the frequency of contracted pelves as varying from 1.13 to 13.1 per cent. These differences are accounted for partially by different methods, and also by the fact that in some cases only those pelves were considered contracted in which dystocia had resulted from the size of the pelvis. In examining 1,224 patients by pelvimetry and palpation, both external and internal, the writer found 25 per cent. of pelves smaller than the average. Among these patients were many immigrants and a considerable number of negroes. There were no Chinese or Indian women among the number.

Diagnosis.—The diagnosis of contracted pelvis is to be made by observation of the patient's stature and general condition, by examination of her pelvis, and her skeleton should deformity exist. A history of previous complicated labor, of disease of the skeleton, or injury to the bones, should arouse suspicion that contraction may be present. No statement of the patient, however, or of her friends, is of more than partial value. The physician must depend entirely for accurate information upon himself. While in complicated cases of rare pelvic distortion an elaborate series of measurements are necessary for the accurate description of an abnormal pelvis, for practical purposes the physician may obtain information regarding the size of the pelvic brim, of the pelvic cavity, and the outlet with but simple apparatus and without prolonged examination.

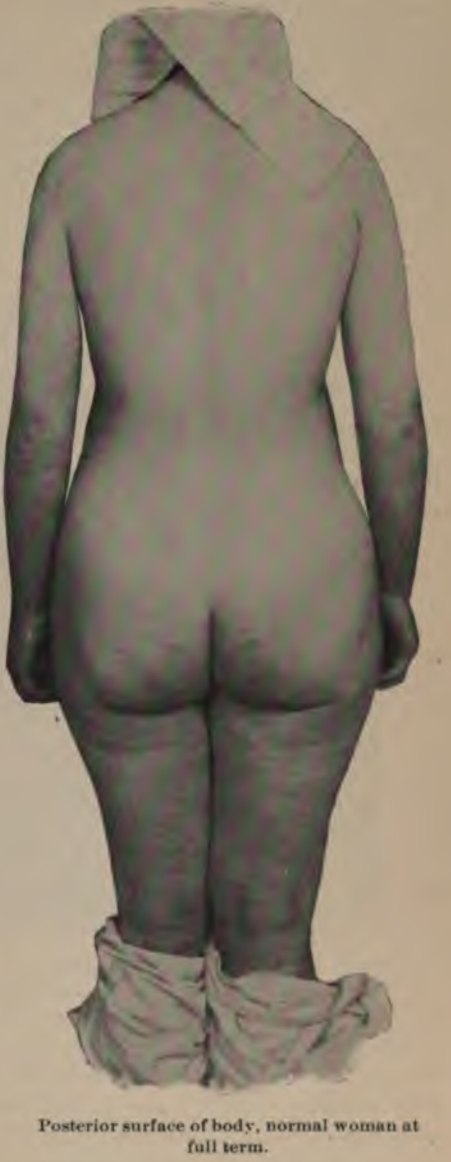
The brim of the pelvis may be measured and estimated by pelvimetry and by palpation. If the distance between the anterior superior spines of the ilia, between the outermost points of the crests of the ilia, between the trochanters of the femora, from the posterior superior

FIG. 121.



Attitude and contour of normal woman at full-term pregnancy.

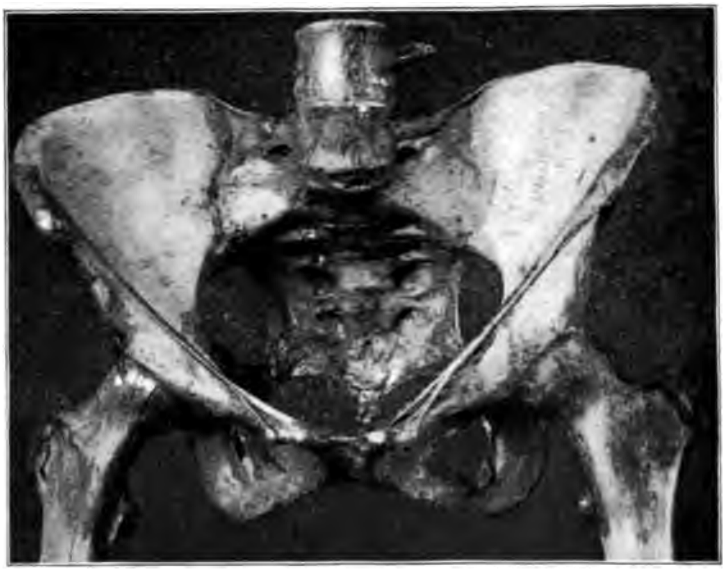
FIG. 122.



Posterior surface of body, normal woman at full term.

spine of the ilium on one side to the anterior superior on the other, and from beneath the spine of the last lumbar vertebra to the middle of the pubic joint in front, be taken, and these be found smaller than the average, but proportionate to one another, the diagnosis of symmetrically contracted or justo-minor pelvis may be made. The antero-posterior diameter of the pelvic brim may also be measured by internal examination with the finger tip upon the promontory of the sacrum and the finger of the external hand marking the distance beneath the edge of the pubic joint. To measure approximately the cavity of the pelvis, the hand may be introduced within the vagina and the sides of the pelvis palpated, and the distance from one side to the other estimated. The outlet of the pelvis may be examined by the fingers or by measuring with a pelvimeter between the tuberosities of the ischia. The circumference is obtained by measurement with a tape line, the measure passing below the pelvic brim and parallel with Poupart's ligament.

FIG. 123.



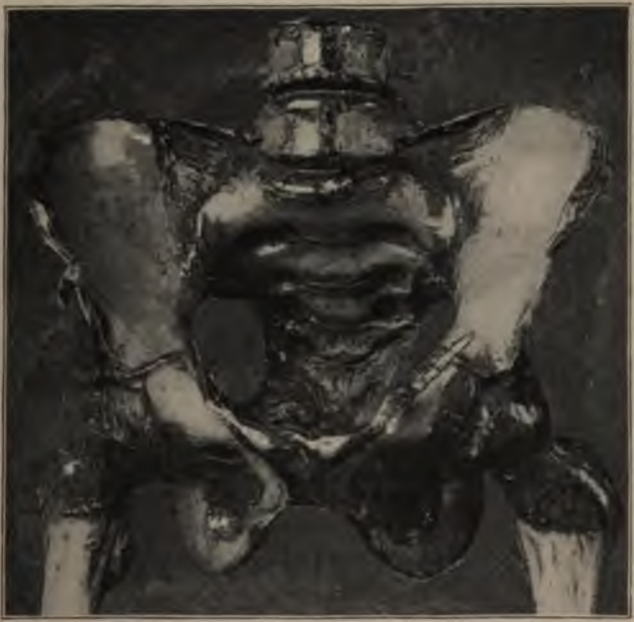
Justo-minor pelvis; from Museum of Jefferson Medical College. (From original photograph.)

Symmetrically Contracted or Justo-Minor Pelvis.—When, by examination, it is found that the pelvis is smaller than the average in all diameters, but that the measurements retain the usual proportions existing between those of the normal pelvis, the pelvis is said to be symmetrically contracted or justo-minor. This was the most frequent abnormality observed in the series of cases examined. Of all forms of pelvic contraction this comprised 13 per cent. Other observers have also found the justo-minor pelvis frequently.

Etiology.—The cause of this abnormal condition of the pelvis is not definitely known. It does not depend upon the height of the woman, for tall and slender women are more liable to this complication than are short and broad women. In some women the pelvis retains its infantile type, and does not assume the characteristics of the female pelvis.

Lack of muscular development in several generations undoubtedly tends to produce an imperfect development of the pelvis, as it is rare to find such among muscular and well-developed women. These cases are deceptive, for, as no deformity exists and the patient is crippled in no way, there is no reason for suspecting an abnormal condition in her pelvis.

FIG. 124.



Infantile pelvis; from Museum of Jefferson Medical College. (From original photograph.)

Labor in Justo-Minor Pelves.—The course of labor with such a patient will depend entirely upon the size of her child and her muscular and nervous vigor. If the child be as much below the average in size as is the mother's pelvis, no complication in labor need arise; but if the child be of average size and development, the course of labor will rarely be normal. Where disproportion is slight the head may enter the pelvis in very strong flexion and be born after prolonged and exhausting labor. The skull will be greatly compressed, and difficulty may be experienced in delivery of the shoulders. In

[illegible]

[illegible]

[illegible] — [illegible]

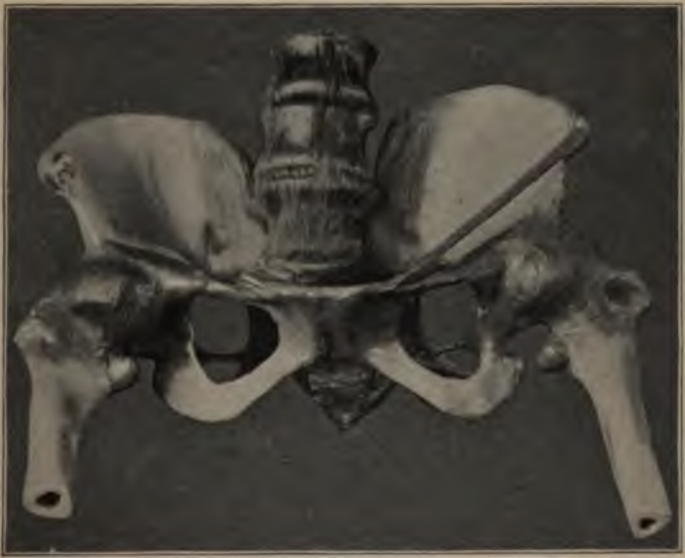
[illegible] — [illegible]

[illegible] — [illegible]

population of the United States. The causes of rhachitic pelves are those which induce rhachitis in the skeleton. Many of these patients have the disease before birth, and those who live amid poor surroundings rarely recover from it.

Diagnosis.—The diagnosis of rhachitic pelvis is made by observing the signs of rhachitis in the skull and long bones of the patient, and also by examining the pelvis. The characteristic enlargement of the cranium as contrasted with the face, the enlargement of the epiphyses, the rhachitic rosary upon the chest, and the catarrhal condition of the bronchial and intestinal mucous membrane commonly present in these cases will assist greatly in making a diagnosis.

FIG. 125.



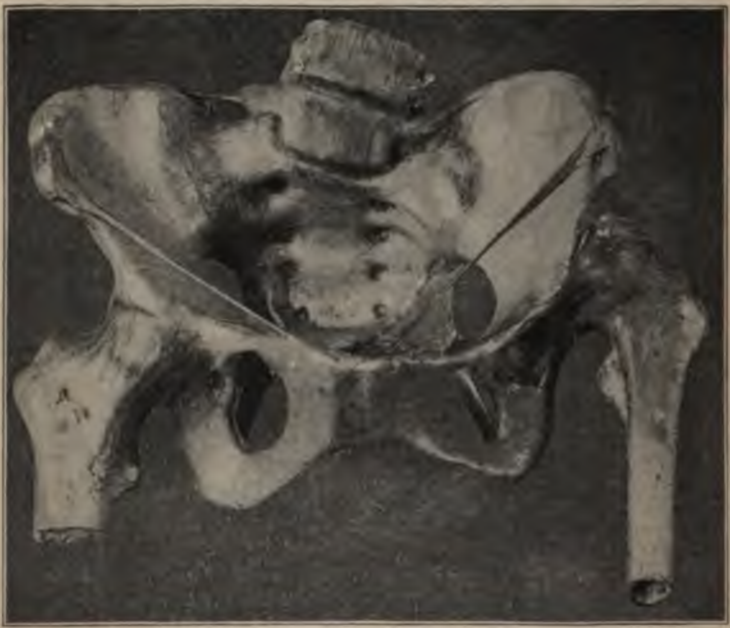
Highly flattened rhachitic pelvis; from Museum of Jefferson Medical College. (From original photograph.)

If pelvimetry be practised, it will be found that the proportion existing between the measurements taken between the anterior superior spines and the outermost points of the crests of the ilia is destroyed. While the difference between these should be between two and three cm., there is no difference, or the relationship is reversed, the distance between the spines being greater than between the crests. In addition to this deformity the pelvis is commonly flattened, the antero-posterior diameter being considerably lessened. The results of these contractions is a pelvic cavity irregular in outline, being not only flattened, but contracted from side to side at the posterior third of each lateral half.

The rhachitic pelvis should be carefully palpated to ascertain the contour of its cavity. The use of the Röntgen rays is also advisable where an exact knowledge of the pelvis is desired.

Labor in Rhachitic Pelves.—The course of labor in rhachitic pelves is influenced not only by the shape and size of the pelves, but also by the muscular strength of the mother, which in highly rhachitic women is often deficient. In addition to this, it must be remembered that the fœtus often shares the mother's disease, and that its enlarged rhachitic skull adds a serious complication to labor in these patients. If it be found that the antero-posterior diameter of the pelvic brim be 8 cm., or $3\frac{1}{2}$ inches, and the patient be at term, spontaneous labor may be allowed, with the hope that the head can be extracted by forceps. If, however, the pelvis be smaller than this, and when labor occurs the head does not engage, the patient must be delivered by surgical procedure. In view of the frequency of intrauterine fœtal rhachitis, caution must be exercised in selecting symphysiotomy, the danger being that the large skull of the child may seriously injure the mother in passing through the vagina and vulva. Unless these parts be well developed and readily dilatable, delivery should be accomplished by abdominal section, followed if requested by hysterectomy. If a patient with rhachitis whose antero-posterior pelvic diameter is 9 cm. be seen early in pregnancy, labor may be induced at the eighth month with the expectation of securing delivery through the vagina. In rhachitic pelves with smaller antero-posterior diameter than 9 cm., the patient

FIG. 126.

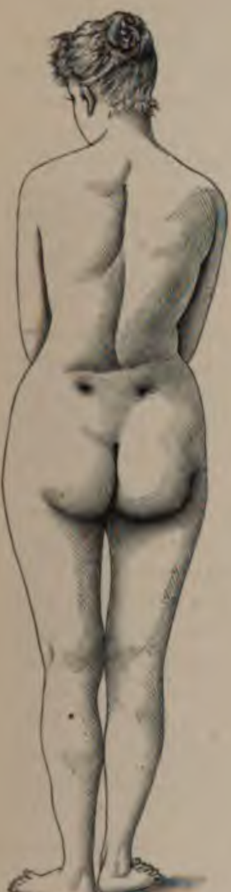


Irregularly deformed rhachitic pelvis with scoliosis; from Museum of Jefferson Medical College. (From original photograph.)

should be allowed to go to term and if necessary be delivered by abdominal section.

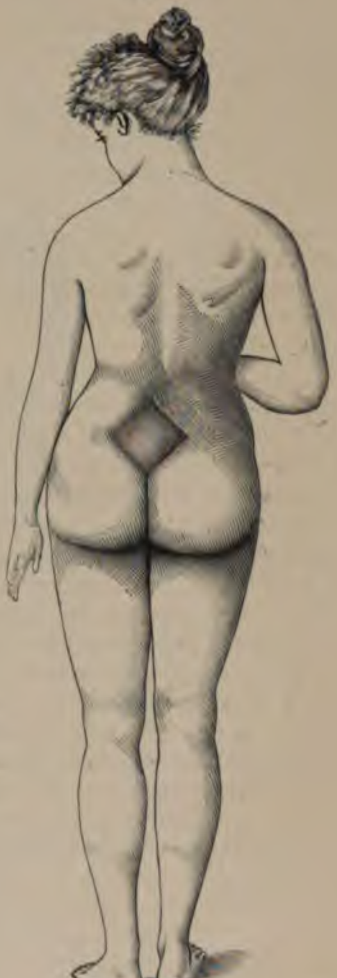
In cases where labor occurs spontaneously in such pelves, the head enters the brim of the pelvis turned transversely and inclined laterally upon itself. If the skull be not ossified and labor pains be strong, the skull may mould itself to the cavity of the pelvis and be born without intervention. The head will be pressed upon and irregularly moulded, but fatal injury need not necessarily occur.

FIG. 127.



Woman with flat pelvis, showing imperfect contour of back. (STRATZ.)

FIG. 128.



Well-formed woman, with lozenge-shaped space in back plainly marked, showing normal pelvis. (STRATZ.)

Frequency.—Rhachitis may deform the pelvis in irregular ways, considerably enlarging some diameters and lessening others. It may be associated with spinal deformity, which alters the direction of the pelvic axis and complicates delivery by forceps. The frequency of its occurrence—6 per cent. in the series of cases quoted—and the fact that it may be accompanied by fœtal rhachitis, makes it a most interesting and important complication in labor.

The Flat Non-Rhachitic Pelvis: Etiology and Frequency.—By simple flattened pelvis is understood a pelvis contracted in its antero-posterior diameter only. In many cases the transverse diameter of the pelvis is increased, while the antero-posterior is diminished. The causes of flattening of the pelvis are failure on the part of the patient to walk and actively exercise, and thus supply, through the femora, the counter-force needed to develop the two lateral halves of the pelvis symmetrically. The weight of the body and spinal column directed downward tend to force the promontory of the sacrum downward and forward. This force is opposed normally by the force directed against the sides of the pelvis through the femora while the patient walks.

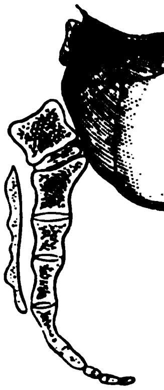
If the patient suffers from infantile paralysis or from any cause which prevents exercise while the pelvis is developing, flattening may result. No other cause is known for this condition in the pelvis, and no other deformity is present in the skeleton, nor is there a history of disease to excite the suspicion of the physician. The flat non-rhachitic pelvis was found in 5.7 per cent. of the 1,224 cases in our series.

Diagnosis.—The diagnosis of flattened pelvis is made by pelvimetry and by internal examination. If the pelvis be measured, the shortening in the antero-posterior diameter will attract attention at once. The fact that no other diameters in the pelvis are contracted will lead to a diagnosis of simple flat pelvis. By internal examination the fingers pass readily to the promontory of the sacrum, although the other portions of the pelvis show no signs of deformity.

Labor in Flat Non-Rhachitic Pelves.—The course of labor in simple flat pelves results from the effort of the head to bring its smallest diameter in relation with the smallest diameter of the pelvis. The head will be found transversely across the pelvis, the occiput upon one side and the face upon the other. This position of the head brings the bitemporal diameter of the skull in relation with the antero-posterior of the pelvic brim. The occiput will fit into the concavity of the pelvic brim at one of the sacro-iliac joints, while the face and chin occupy a similar location upon the opposite side. If the antero-posterior diameter of the pelvis be 9 cm. and uterine contractions are strong, the head may descend spontaneously through the pelvic brim, come upon the pelvic floor, and rotate the occiput anteriorly, completing labor in the normal manner.

Treatment.—In cases in which the patient is seen early, before the membranes rupture, it is preferred by some to perform podalic version and bring the child through the pelvis with the head coming last. The reason for this method of delivery lies in the fact that when the head comes last the bitemporal diameter is brought most easily into relation with the antero-posterior diameter of the pelvic brim, and thus the head can be made to pass through the pelvis when labor would be impossible if the head presented. If spontaneous birth does not occur in flat pelves, version is to be preferred to the use of the forceps, because the latter must be applied with one blade over the face, thereby injuring the child severely. In cases in which the head has engaged, but has made no progress, the effort should be made to bring it through the pelvis by suprapubic pressure until it can rotate partially upon the pelvic floor, when the forceps may complete the delivery.

FIG. 129.



Head engaging in flat pelvis. (SCHROEDER.)

Symphysiotomy is especially well adapted to flat pelves of little contraction, in which the external parts are sufficiently developed to permit safe delivery. In cases, however, in which the pelvis measures less than 8½ cm. in its antero-posterior diameter delivery must be effected by abdominal section.

Maternal and Fœtal Mortality and Morbidity.—The mortality rate for the mother in simple flat pelves is not necessarily high if early diagnosis is made and good judgment be used in selecting the method of delivery. The mortality for children is also not excessively high where the degree of pelvic flattening is slight. Where, however, the pelvis is considerably narrowed, if version be performed and the head be dragged forcibly through the pelvis, the skull may be fractured by contact with the promontory of the sacrum. In difficult extractions it is often necessary to put the finger in the mouth of the child and aid delivery by strong traction upon the lower jaw. This may also injure the child by causing respiration and favoring the inspiration of material from the vagina and the development of inspiration pneumonia. In the high degrees of flat pelves the induction of labor should not be practised, but the patient should come to term and be delivered by abdominal section. If labor be induced at eight months in cases where the antero-posterior diameter of the pelvis is 9 cm., the chance for the birth of a living child is sufficiently good to warrant the selection of this method of treatment.

The Diagnosis of the Comparative Size of Mother and Child.—As regards the treatment of labor in the forms of contracted pelves which have just been considered, it is of the greatest importance that early diagnosis be made. This cannot be assured unless the physician makes it a routine matter to examine all cases by pelvimetry. In view of the serious consequences which follow failure to recognize contraction of the pelvis, and inasmuch as pelvimetry, properly conducted, requires no exposure of the patient and adds nothing to her risk by infection, there can be no reasonable objection to this practice.

When an abnormality in the pelvis is observed, the comparative size of the fœtus must next be considered by palpation. It is well to combine with palpation a thorough internal examination of the pelvis. This often requires anæsthesia; but, in view of the importance of such knowledge, the use of anæsthesia is not only justifiable in these cases, but clearly indicated. Chloroform, ether and bromide of ethyl are well suited for such use, and are but slightly disagreeable to the patient. If it be found that the fœtus can engage in the brim of the pelvis and can be readily pressed downward into the pelvic brim, if viability is assured, labor may be promptly induced with the expectation that a living child will be born without surgical interference. If, however, the head will not engage, the time for the induction of labor is past, and the choice of delivery by surgical operation must be made. The decision should be made after consultation with the parents of the child, and should they prefer to have labor induced, with the understanding that the child's life will be sacrificed if it cannot be born through the vagina, their choice must be accepted.

Craniotomy.—The question of craniotomy upon living children is a matter of individual conscience. Obstetrically considered, in cities where patients can be taken to hospitals and good surgical care secured, physicians are at perfect liberty to retire from a case rather than destroy the life of the fœtus. The statement must be made that a reasonable chance of recovery for mother and child exists by surgical delivery. If the parents are not willing to take this risk, but demand craniotomy, the attendant may retire and someone else be summoned. In cases, however, of practitioners who are without hospital accommodations, and often without competent assistance of any kind, the situation is different. The chance for mother and child by surgical delivery and by craniotomy must be clearly stated to the parents, and if the assistance of one or more physicians who are intelligent and conscientious enough to be clean can be secured, delivery by surgical procedure may be undertaken. If, however, such aid cannot be procured and craniotomy is demanded, the practitioner must remember that the mother's life takes precedence, and it is his duty, under protest, to accede to the exigencies of the situation.

Where the services of a priest have been requested by the patient and her friends, his influence will usually be given against embryotomy and in favor of any method of delivery offering a reasonable hope for mother and child. If the physician wishes to avoid embryotomy, he will do well to enlist the aid of the priest, which is usually given with alacrity.

Neglected Labor in Contracted Pelves.—The after-results of neglected labor in the more common forms of contracted pelvis are sufficiently trying to urge upon the physician the duty of prompt relief. If delivery is accomplished without assistance, it is often at the expense of laceration or fistula to the mother, and frequently at the cost of the child's life. Those who neglect labor in contracted pelves are rarely sufficiently intelligent to practise antiseptic precautions, and hence puerperal sepsis is often added to complicate recovery. Rupture of the uterus may occur in cases where labor pains are strong and the head cannot enter the pelvis. Postpartum bleeding following relaxation of the uterus often accompanies delivery in these patients. On the contrary, there are few serious complications of obstetrics which give better results in saving the lives of mother and child than do cases of contracted pelves, promptly delivered by suitable operation.

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Maternal Mortality of Contracted Pelves.—Of these mothers whose cases have been quoted, 1.2 per cent. died. The septic mortality in these cases was .5 of 1 per cent. While many of these patients were delivered in a maternity hospital, a large number were attended at their homes, amid surroundings varying in the degree of filth.

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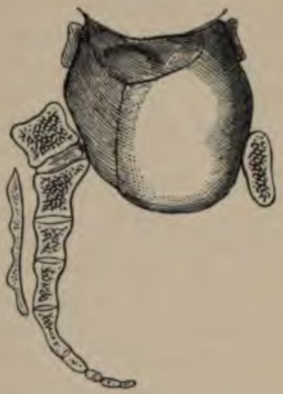
FIG. 129.



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Infant Mortality of Contracted Pelves.—The total infant mortality of the entire series of cases quoted was 6 per cent. The infant mortality of contracted pelves is a matter dependent almost entirely upon diagnosis and operation. Cæsarean section in competent hands has in itself no infant mortality, while symphysiotomy in appropriate cases has a low rate of infant mortality. Failure to diagnosticate pelvic contraction in continued labor and unsuccessful attempts to deliver by forceps produce a very high infant mortality in contracted pelves.

Choice of Methods of Treatment in Contracted Pelves.—The choice of a method of treatment in a case of contracted pelvis is always a matter attended with much difficulty and responsibility. We have no positive way of determining the size and contour of the fœtal cranium. The use of the Röntgen rays is approximately successful, but is often impracticable. It is difficult to obtain a definite criterion by which we can determine whether to allow a patient having a contracted pelvis to wait for spontaneous labor or whether it is the duty of the physician to interrupt the pregnancy. As regards the induction of labor, at the present time, in good hands, the operation is attended with a very low maternal mortality and morbidity. Less than 1 per cent. is the average. For the fœtus, mortality and morbidity must be considerably higher. The fact that the child is premature, and that it must be delivered through a cervix not prepared to perfectly dilate, increases greatly its risks. There is no method of inducing labor which does not carry with it some slight risk for mother and child in the operation itself. In contracted pelves the operator, after consulting with the parents of the child, must determine upon whom the greater risk must be laid. If the mother's welfare is to be alone considered, then the induction of labor is indicated. If the mother is willing to take a reasonable chance with the hope of a living child, then the induction of labor must be declined. Factors which enter into the problem are the age and constitution of the mother, the size, weight, and type of development of the father and the circumstances in which the parents live. Experience in this, as in other matters, is of the greatest value. If the mother has lost a child in difficult labor, this affords proof positive that the passage of the fœtus at full term through the pelvis will be attended with difficulty.

We may summarize these considerations as follows: Where the parents are of average development and the internal antero-posterior diameter of the mother's pelvis measures more than 9 cm., the birth of a living viable child in spontaneous labor is possible. If the mother will take abundant exercise, especially in walking, during the eighth month of gestation, the fœtal head will usually enter the pelvic brim, and labor may occur a short time previous to the full term of pregnancy. When, however, the internal antero-posterior diameter of the pelvic brim measures less than 9 cm., or 3.6 inches, the birth of a living child cannot be expected without the induction of labor or without other operative interference.

In selecting operations in contracted pelves, especial attention must be given to the general condition of the mother. Even if the child be living, if repeated unsuccessful attempts at forceps delivery have been made, the child must be considered as practically lost, and craniotomy should be selected. Unless the obstetrician knows positively what antiseptic precautions were taken, he must consider such a mother as probably infected also. Abdominal section should be avoided if possible in such cases. If the use of forceps is limited to cases where engagement is well advanced and version is restricted to slightly flattened pelves, only the best results will be obtained.

In choosing a time for the induction of labor, the operator has the choice of two methods. One consists in examining the patient at intervals of a week or ten days after the thirtieth week of gestation, endeavoring at each examination to fit the head of the fœtus into the pelvis by suprapubic pressure, while the fingers within the vagina examine the descending head. When the head enters the brim with difficulty, labor should be induced. The other method consists in taking an average time for the induction of labor in all cases of contracted pelves in which the internal antero-posterior diameter of the pelvis is sufficiently large to justify the operation. By some the thirty-second week is chosen, by others the thirty-fourth. By the latter method, that of taking a fixed time, pregnancy may possibly be interrupted a few days too soon in some cases, and in other cases the slightly increased weight of the child which a short delay causes may occasion some additional difficulty in the extraction of the fœtus. The method, however, has its advantages, and is usually followed by good results.

In multiparous women a history of a previously difficult labor should call especial attention to the possibility of pelvic contraction. In estimating the chance of spontaneous delivery in contracted pelves, the natural increase in the weight of the second, third, and fourth children must be remembered in dealing with healthy patients in good surroundings. In the case of rhachitic pelvis, the fact that intrauterine rhachitis may injure and deform the cranium of the fœtus may also be remembered. The attention of the obstetrician must not only be directed to the mother, but the size, type, and development of the father must be taken into consideration.

CHAPTER X

LABOR IN LARGE PELVES.

Frequency.—In 7 per cent. of cases examined the writer found justo-major or symmetrically enlarged pelves. Justo-major pelves are commonly observed in women above the ordinary stature. Such patients are not necessarily tall, but broad in the shoulders and hips. They are usually possessed of good muscular systems, generally women coming from working people and who have been accustomed to muscular exertion from childhood. They are often possessed of excellent powers of assimilation, so that the fœtus in these cases is frequently above the average size and seems to correspond to the pelvis. When this is the case, the mechanism of labor is the normal one, and complications in labor do not necessarily arise. These women occasionally have excessively large children, and dystocia from disproportion may complicate birth.

Labor in Justo-Major Pelves.—The course of labor may be abnormal by reason of the disproportionately large size of the mother's pelvis. While this condition rarely risks the mother's life, the child may present in an abnormal manner, and may be in considerable danger by reason of complicated labor.

Diagnosis.—The diagnosis of justo-major or symmetrically enlarged pelvis is made by pelvimetry, which readily discovers the abnormality in size. Unless the physician practises pelvimetry in all cases, his attention may not be drawn to a justo-major pelvis except by the rapid and easy course of labor. In other cases abnormalities, to which reference has already been made, may draw his attention to a failure in the normal mechanism of parturition.

Treatment.—The treatment of labor in justo-major pelves consists in keeping the patient in the recumbent position during the second stage of labor and during the latter portion of the first stage when dilatation is well advanced. When the membranes rupture, the obstetrician must be on his guard to detect promptly prolapse of the cord, transverse presentation or other abnormality. Liability to hemorrhage is sometimes increased in these cases, and extraordinary precaution must be taken to secure good uterine contraction. In cases where the fœtus is proportionately large the usual mechanism of labor is commonly seen.

The child is often found abnormally movable in these cases and with no typical presentation. If considerable amniotic liquid is present, it will escape rapidly and freely when the membranes rupture, and a coil of the cord may prolapse or the fœtus may be caught in the pelvis in an abnormal position. Thus, shoulder presentations or transevrse positions are observed in these cases. The face may present or the occiput be turned behind. If the patient be a strong woman, with well-developed uterine muscle, labor may be rapid and easy, and terminate precipitately if she be upon her feet when the membranes rupture. The child may be expelled upon the floor and be injured in the fall, or the cord may be ruptured, or inversion of the womb and bleeding may occur.

It is well, therefore, to keep the patient in bed in these cases during labor, and to examine her promptly as soon as the membranes break, to rectify any abnormal presentation which may develop. Should a transverse position be present, version must be performed, while a malposition of the head may be corrected by the introduction of the hand and labor allowed to terminate spontaneously. If the birth-canal be well developed, the mother is seldom injured by delivery. Rapid emptying of the uterus may cause imperfect contraction, and hence danger of hemorrhages. If labor has been precipitate, the physician must take especial pains to avoid postpartum bleeding.

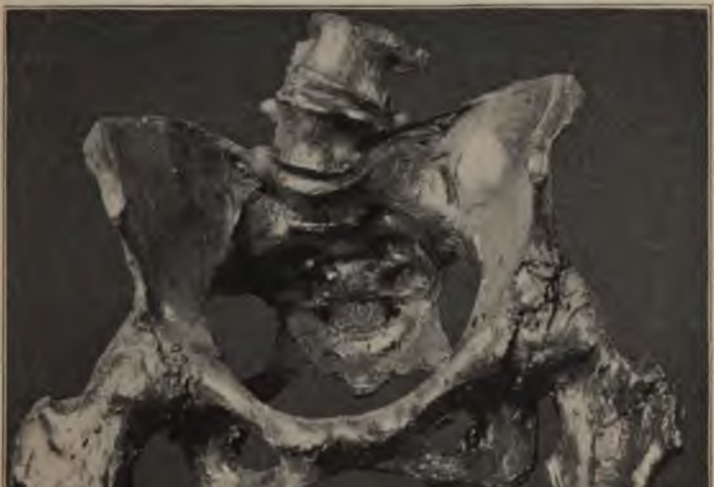
If multiple pregnancy is present with large pelvis, impaction of the children may result, with death to one or both, unless delivery is promptly effected.

CHAPTER XI.

LABOR IN RARE VARIETIES OF DEFORMED PELVES.

The Obliquely Contracted Pelvis.—Among the rare varieties of deformed pelves is the obliquely and irregular contracted pelvis. This was found in .2 of 1 per cent. in the series of cases to which reference has been made. From its complete description by Naegele, it is often called the Naegele pelvis. Its etiology is not always clear. In some cases disease or injury in one hip joint has resulted in lack of development on one side of the pelvis, while in other cases an impacted fracture of the neck of the femur driving inward the acetabulum has caused contraction of one side of the pelvis. The diagnosis is readily made by pelvimetry. The complete examination of such a pelvis

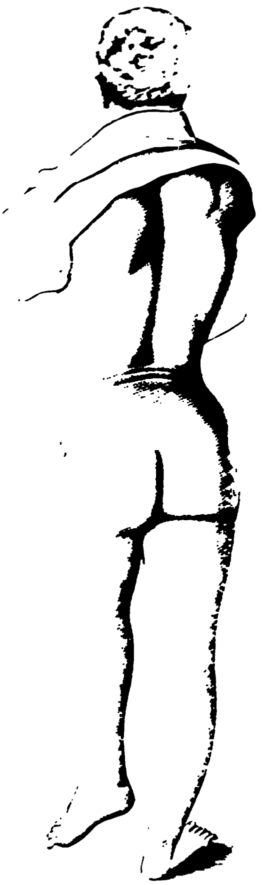
FIG. 130.



Obliquely contracted and irregularly deformed pelvis; from Museum of Jefferson Medical College. (From original photograph.)

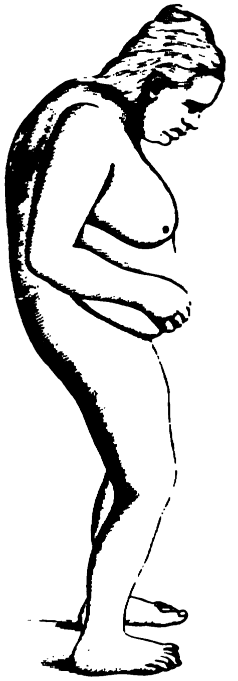
requires a large number of measurements. It is especially important in these cases to carefully palpate the pelvic cavity, as only in this manner can a practical knowledge of the capacity of the pelvis be obtained.

FIG. 131



Obliquely contracted (Naegele) pelvis (SALUS.)

FIG. 132

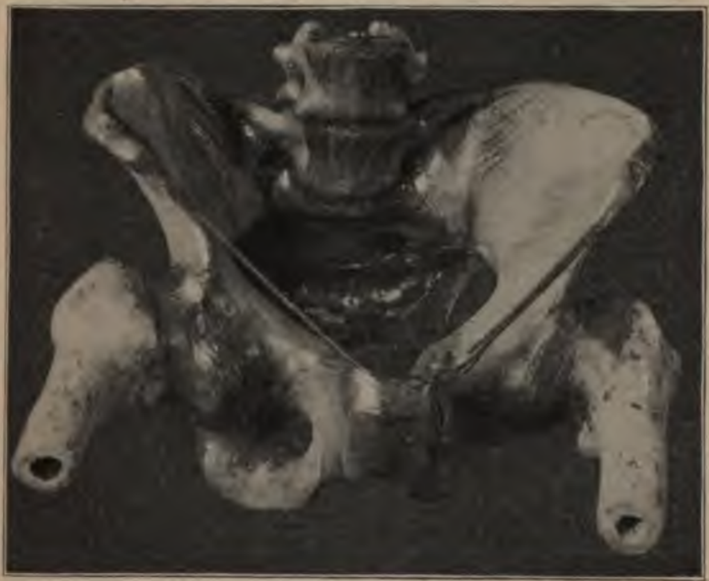


Woman with osteomalacic pelvis (POLGÁR.)

Labor in Obliquely Contracted Pelves.--The course of labor in these cases depends upon the proportionate size of the child and pelvis and the degree of moulding which the head sustains. If the head can enter the pelvis and moulds readily, then labor pains may accomplish delivery. The head may be excessively drawn out, and the child suffer serious results from pressure. If, however, engagement cannot take place, delivery must be accomplished by surgical interference. Symphysiotomy is not indicated in these cases, because it enlarges the pelvis least in those diameters which are most contracted. The preferable form of delivery, if a living child is to be secured, must be the induction of labor or abdominal section if the pelvic contraction is considerable.

Osteomalacic Pelvis.—Osteomalacia is occasionally seen, and produces well-marked pelvic deformity. The pelvis in these patients is gradually lessened in capacity. The rami of the pubes assume the beak shape. The contraction of the pubic joint narrows the pelvis greatly at this point. The sacrum may also be found in abnormal positions in these cases, projecting downward and forward or turned to one side. If the disease be well marked, not only the pelvis, but other portions of the skeleton will suffer from softening and deformity.

FIG. 133.



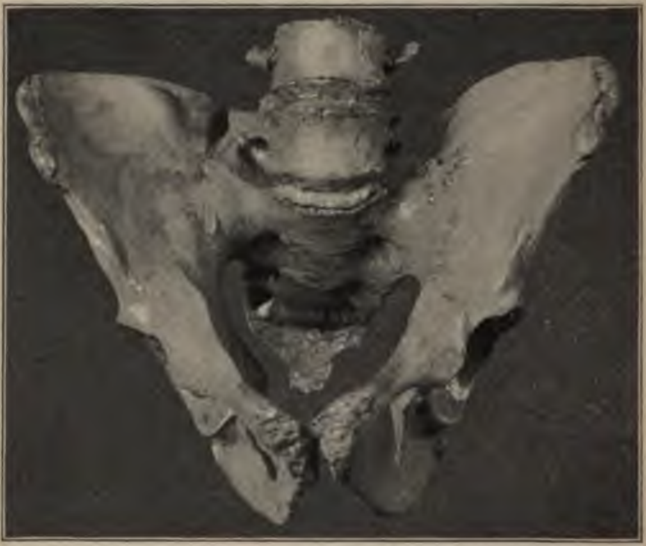
Osteomalacic pelvis; from Museum of Jefferson Medical College.
(From original photograph.)

Diagnosis.—The diagnosis of osteomalacia is made by the softening in the patient's bones, and also by the almost constant pain which is present. Evidence of profound disturbance in nutrition and in some cases variations in temperature are also seen. These cases must be distinguished from rheumatism, septic arthritis, or excessive weakness, with relaxation of the pelvic joints.

Treatment.—The treatment of labor in these cases consists in delivery by abdominal section, followed by hysterectomy, with removal of the tubes and ovaries. Experience has shown that such cases are best treated by oöphorectomy, and that the disease in pregnant women is checked by this procedure.

Irregular Deformities of the Pelvis.—The pelvis may also be narrowed in some cases by contraction in one of its diameters only. Thus the transverse diameter is occasionally much shortened. Any cause which checks the development of the pelvis may shorten its capacity in one of its diameters, often an oblique. Direct violence, as a fall or blow, may fracture the pelvis, and the callus which results may lessen the diameter of the pelvic cavity. Disease of the pelvic bones, as tuberculosis of the hip-joint, may also change the form of the pelvis. Sarcomata may grow from the connective tissue of the pelvis, obstructing the pelvic brim. Spinal deformity occurring in the lumbar region may force the sacrum downward and alter the shape of the pelvic brim. Thus a combined dislocation of the vertebræ of the lumbar and sacral regions upon each other may produce the deformity known as spondylolisthesis. Lateral curvature of the spine, termed scoliosis, may cause partial rotation of the sacrum and alter the shape of the pelvic brim. Projection forward of the vertebræ, caused by tuberculosis of the bodies, may produce the deformity known as lordosis; while hunchback, or the projection backward of the vertebræ, may cause kyphosis. Spinal deformity may not actually prevent the entrance of the head into the pelvis, but if it be well marked it will alter the position of the uterus in the abdomen, will impede the descent of the head, and will prolong and complicate labor.

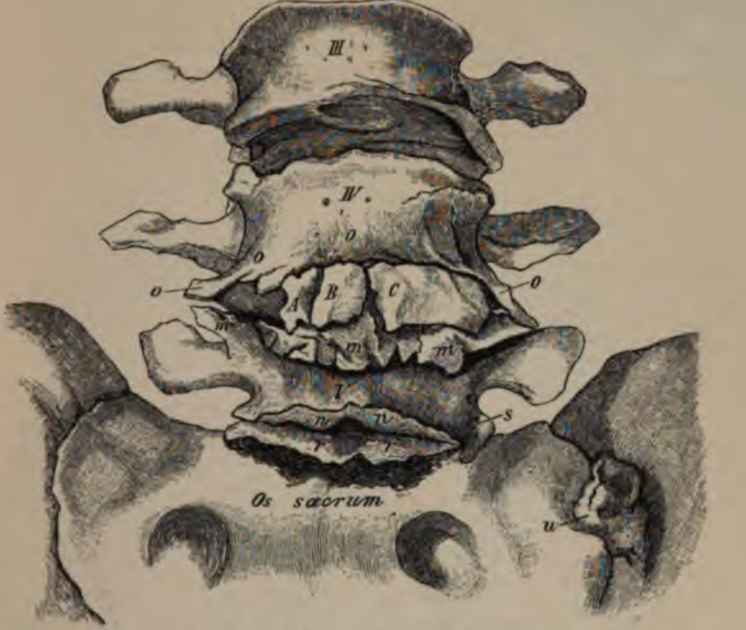
FIG. 134.



Funnel-shaped, highly-deformed pelvis; from Museum of Jefferson Medical College. (From original photograph.)

Treatment.—There can be but one reasonable view of the treatment of these cases of pregnancy in greatly deformed individuals. The

FIG. 135.



Spondylolisthesis. Third, fourth and fifth lumbar vertebræ. (NEUGEBAUER.)
A, B, C. Osteophytic disks. *m, m, m, o. o.* Marginal hyperostosis of bodies of vertebræ. *n, n, r, r.* Everted and deformed edges of vertebræ at sacral promontory. *u.* Extosis at left sacro-iliac joint.

FIG. 136.

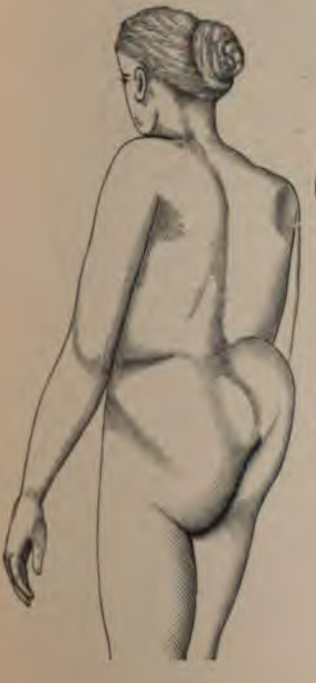


FIG. 137.

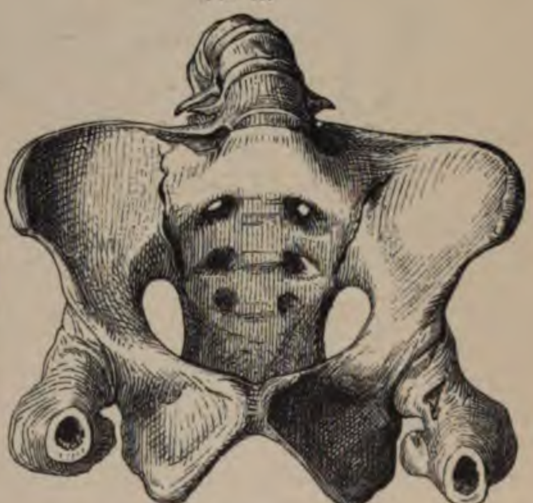
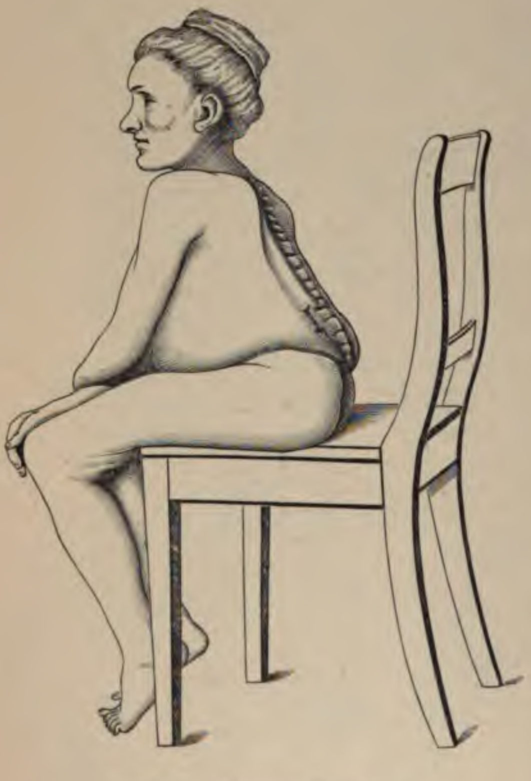


FIG. 136. Woman with spondylolisthetic pelvis. (NEUGEBAUER.)

FIG. 137. Kyphotic, laterally contracted, pelvis. (WEGSCHEIDER.)

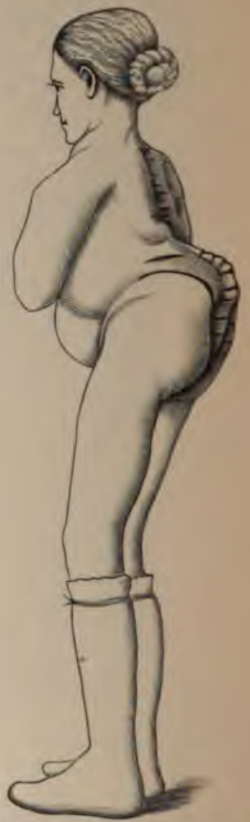
offspring of such parents are rarely endowed with health and vigor, and the birth of children in these patients requires interference often of grave character. With the exception of cases of osteomalacia, pregnancy should be continued to term, every precaution being taken to maintain the mother's health and promote her nutrition during gestation. Delivery should be accomplished in the manner most suitable for each case. If uterine contractions are good and the child is not excessively large, the head will often accommodate itself to the altered contour of the pelvis, and may descend upon the pelvic floor. In these cases the use of forceps will successfully terminate the labor. Where, however, engagement does not occur, but the head remains movable at the pelvic brim or becomes wedged into one diameter of the pelvis, craniotomy or delivery by abdominal section is indicated. In highly deformed individuals the wish of the mother to have further reproduction rendered impossible may be granted. In view of the success of

FIG. 138.



Woman with kyphotic pelvis.
(KLIEN.)

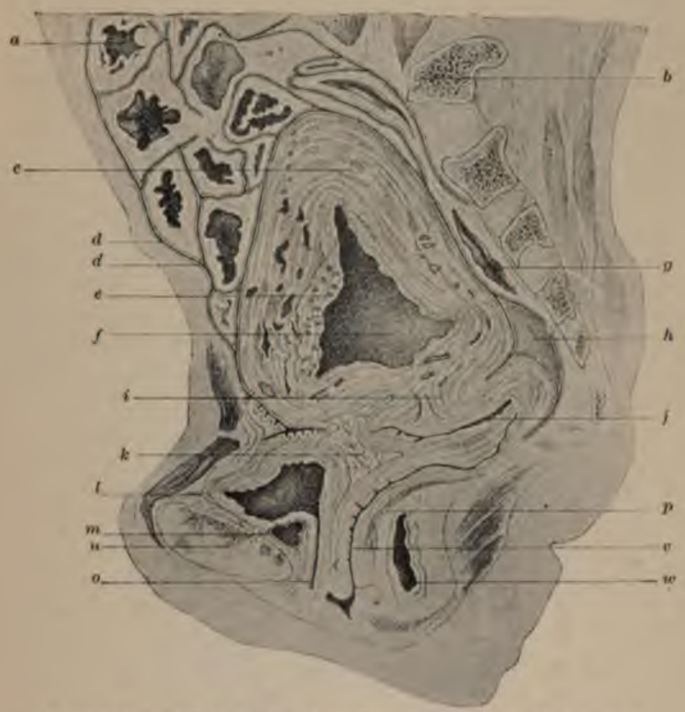
FIG. 139.



Woman with kyphotic pelvis.
(KLIEN.)

repeated Cæsarean section, the physican must call the attention of the parents to the possibility of repeated parturition in this manner. If the parents absolutely refuse abdominal section and demand craniotomy, it must be done. In cases of osteomalacia where the disease is advancing, delay must not be practised, but pregnancy should be terminated at once.

FIG. 140.

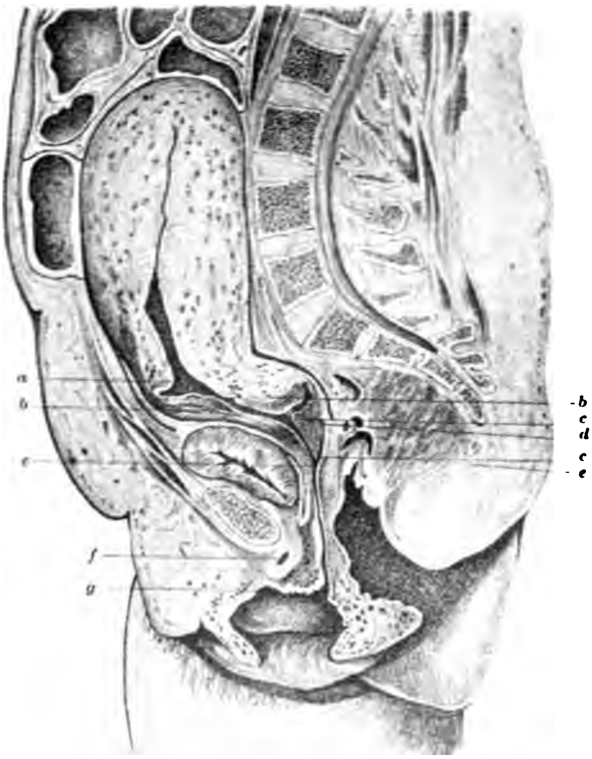


Vertical mesial section, kyphotic pelvis. (BARBOUR and WEBSTER.)

a. Small intestine. *b*. Last lumbar vertebra. *c*. Uterus. *d*. Peritoneum. *e*. Placental site. *f*. Uterine cavity. *g*. Rectum *h*. Pouch of Douglas. *i*. Cervix. *j*. Cervical canal. *k*. Cellular tissue. *l*. Bladder. *m*. Vein. *n*. Symphysis pubis. *o*. Urethra. *p*. Cellular tissue. *v*. Vagina. *w*. Anus.

Prognosis.—The prognosis for mothers and children in these cases is the worst possible if the cases are neglected and allowed to come into spontaneous labor. On the other hand, mother and child have an excellent chance for recovery if delivery be performed at term by surgical interference. These cases are far less dangerous in many respects than are those of less pronounced pelvic deformity. The dwarf and the cripple are so evidently diseased that, if they become pregnant, attention is drawn at once to their condition and the question of delivery is promptly raised. In the lesser forms of pelvic abnormality there is often nothing to draw attention to the condition, and unless pelvimetry be practised patients come into labor without suitable preparation, and are allowed to linger until it is evident that delivery without assistance is impossible. As a result, the most frequent successes in obstetric surgery have, many of them, been obtained in cases of highly deformed pelves. On the contrary, many fatal cases of labor, where mother or child or both have perished after prolonged efforts at delivery, have been cases of medium pelvic contraction which was unrecognized by the attendant.

FIG. 141.



Vertical mesial section, contracted pelvis. (STRATZ and WEBSTER.)
a. Umbilicus. *b.* Retraction ring. *c.* Cervix. *d.* Posterior fornix. *e.* Tip of coccyx. *f.* Urethra. *g.* Urethral orifice.

Not only should physicians practise the examination of the pelvis in every case, but their patients should be taught that such a procedure is part of the care which they have a right to claim from their medical attendant. The physician is not criticised unfavorably for taking precautions, but for neglecting them; and as long as he suggests to his patient no form of investigation which increases her risk, gives pain or great inconvenience, he should insist upon his privilege in this regard.

Maternal Mortality of Abnormal Pelves.— In 392 cases of abnormal pelves under the observation of the writer, a general maternal mortality of 1.2 per cent. occurred. On examination of the causes of death, septic infection was most frequent, and eclampsia and nephritis, pernicious anæmia and exhaustion, and croupous pneumonia in equal frequency among the other causes of death. So far as septic mortality is concerned, cases were equally divided between streptococcus infection and infection with the bacillus coli communis and allied germs. Septic infection in the series of abnormal pelves was .5 of 1 per cent.

From these and other statistics we may learn that those patients having abnormal pelves are exposed to greater risk in pregnancy and parturition by reason of deficient elimination, exhaustion and anæmia, and pulmonary infection than are other patients. The risk of septic infection arises in two ways—first from external contagion by the operator or assistants, and then by infection from the contents of the intestine. In abnormal pelves the fœtus does not descend into the pelvis as readily as in normal cases, fecal impaction is more than usually frequent, and the bacillus coli-communis has unusual opportunity for penetrating the tissues surrounding the intestine; hence a considerable mortality from mixed infection of intestinal origin is seen in these cases.

The natural suggestion from the study of this subject urges the early admission to maternity hospitals of patients having abnormal pelves. Under hospital care they may be properly prepared for complicated parturition. Under hospital observation they may be given work to do which will facilitate the descent of the child into the pelvis, and thus increase the possibility of delivery through the vagina. Should a more serious operation be necessary, it can be done promptly, giving mother and child the best chance.

CHAPTER XII.

LABOR COMPLICATED BY TUMORS OR MALFORMATIONS OF THE PELVIS AND GENITAL ORGANS.

Labor may be seriously complicated by tumors arising from the pelvis or by growths which take their origin from some of the pelvic viscera. Allusion has already been made to tumors of the pelvic bones which may offer great obstacles to labor. The most frequent tumors complicating labor are dermoid and other cysts of the ovary and fibromata of the uterus. Rarely an abdominal viscus may be so far displaced as to become impacted in the pelvic brim.

Malignant Growths.—Cancer may attack the rectum or uterus and encroach upon the lower portions of the pelvic cavity, preventing delivery. In diagnosticating cancer of the rectum, it must be remembered that occasionally the bowels are so thoroughly impacted with fæcal matter that it may give to the finger the sensation of the hardened mass found in malignant disease. If the bowel be thoroughly emptied, this obscuring element in diagnosis is readily removed.

The treatment of malignant disease affecting the rectum and attacking the connective tissue of the pelvis and uterus is entirely surgical. Pregnancy should be ended as soon as the diagnosis of malignant disease is made. If birth can occur through the vagina, it should be allowed to take place in that manner; but if delivery is rendered impossible in this way, abdominal section must be performed. If labor occurs at term in a patient suffering from malignant disease in whom delivery is delayed by cancerous tissue, abdominal section and delivery with total hysterectomy are indicated.

Fibromata of the Uterus.—Labor may be rendered impossible by fibroid tumors of the uterus. Submucous tumors are often detached from the uterine tissue during labor, and, a pedicle forming, may present in advance of the head in labor. At the beginning of labor such a tumor may be found near the head and apparently blocking up the pelvis. In these cases, as a rule, Nature succeeds in effecting delivery by gradually drawing the tumor up and forcing the head down. After the birth of the child the tumor may present and be partially delivered, occasionally with inversion of the uterus. The physician should not despair of normal delivery as long as the head advances at all in these cases. If the tumor presents before the birth of the child, its pedicle must be ligated and removed. If it is discovered after the expulsion of the fœtal body, the same treatment is indicated, care being taken not to make traction upon the pedicle to avoid inverting the uterus.

Interstitial fibroids may seriously complicate labor by blocking the cavity of the pelvis and preventing the descent of the child. The recognition of this complication demands thorough examination under anæsthesia. The treatment of labor complicated by interstitial fibroids of large size is hysterectomy. Where the tumor is small, the head may be delivered with forceps. The mother is exposed to danger by hemorrhage in these cases, as the vessels of the endometrium which cover the tumor are enlarged, and if these tissues are torn in delivery it will be necessary to tampon the uterus with gauze to check bleeding. In choosing abdominal delivery in labor complicated by fibroids the operator must remember that a uterus the seat of fibroid disease will not heal after incision and suture. Hence the reason for choosing hysterectomy in these cases and declining cœliohysterotomy.

Subserous fibroids complicating labor can usually be pushed aside if pedunculated, and the fœtal body be brought to descend. If, however, the tumor has no pedicle, abdominal incision and myomectomy are required. If the bed of the tumor and serous covering be closed by successive layers of suture, hemorrhage can usually be controlled.

If, however, too large a cavity be left when the tumor is shelled out, to avoid bleeding, its bed may be tamponed with gauze, which may be brought out through the abdominal incision. If the tumor is large, it is best to perform hysterectomy. When subserous fibroids are discovered during pregnancy, if they are of considerable size and in such a portion of the uterus that they may impede delivery, myomectomy should be performed.

Ovarian Tumors.—Labor complicated by ovarian tumors resulted fatally to the mother, in the majority of cases, before the days of antiseptic surgery. If an ovarian cyst be impacted at the brim of the pelvis, it may be ruptured by strong labor pains, its contents escaping into the peritoneal cavity. Peritonitis will follow, with usually fatal results. Ovarian tumors may become strangulated by torsion of the pedicle developing during labor. A solid tumor of the ovary may be forced down and into the pelvis, making spontaneous delivery impossible.

In these cases the first effort should be to push the tumor to one side and bring the head into the brim of the pelvis. This will require anæsthesia, and must be done gently to avoid rupture. Should this effort fail, if the tumor be a cyst and low in the pelvis, it may be punctured and emptied and drained. This, however, while often the more feasible plan of treatment, is less safe than abdominal section and the removal of the tumor. The danger of septic infection after puncture is great, and should be avoided if possible. In cases where the tumor bursts the abdomen must be opened as soon as possible and thoroughly washed out with normal saline solution. The tumor should be removed. Solid tumors of the ovary may be more safely dislodged by manipulation, but should they become impacted, their removal is a necessity. Often, if craniotomy be performed, the tumor would be so bruised and injured that necrosis of its tissue would result, followed by the development of septic poison.

Broad-Ligament Cysts.—Cysts of the broad ligament may rupture during the early stages of delivery with but little damage to the patient. The fluid of these tumors is usually clear and sterile, capable of absorption without injury, while the process of rupture brings about a spontaneous cure. It is often impossible to determine the nature of an ovarian cyst without abdominal incision, hence if a cyst of the broad ligament of considerable size is present during pregnancy it will be safer to perform abdominal section and to remove it.

Hernia.—Hernia may complicate labor and seriously threaten the mother's life. This hernia may be intestinal and femoral in variety, or occasionally hernia of the uterus develops. The bowel may also descend into the labium and be mistaken for vulvo-vaginal abscess. A swelling occurring in the region which hernia may occupy should not be hastily punctured or incised, but should be reduced, if possible, by taxis.

Should intestinal hernia complicate labor, and reduction by taxis be impossible, operation for strangulated hernia should be performed.

The results of such an operation should be quite as good as in the non-pregnant patient, while the operation itself need not complicate the patient's recovery from labor.

Hernia of the uterus may occur in patients whose tissues have been greatly weakened by anæmia or exhausting disease or by repeated overdistention. The indications for treatment in these cases are to replace the uterus in its proper position and to maintain it there by a suitable abdominal bandage Ventral hernia will usually follow these cases, and may demand operation.

Tumors of the Vulva.—The labia may become infiltrated with serum during labor, and the degree of distention may be so great as to delay the expulsion of the child. It is better to avoid puncture and to hasten delivery by forceps with these patients. Especial care must be taken to maintain the parts in an aseptic condition, as the tissues readily break down if infected.

An effusion of blood into the labia may occur, forming hæmatoma during labor. This may be caused by the rupture of a vein or by long-continued pressure upon unyielding tissue. The distention may become so great that rupture may follow, with severe bleeding. It is well in these cases to effect delivery as soon as possible in the hope of avoiding rupture. Should this occur, however, a firm tampon of gauze may be applied until delivery is completed. The edges of the torn tissues must then be brought together by deep, continuous, catgut stitch, the vagina firmly tamponed with iodoform gauze, and a firm antiseptic dressing applied over the vulva. These cases readily recover if septic infection does not occur.

Vulvo-Vaginal Abscess.—Vulvo-vaginal abscess is not infrequent in pregnant patients who have had gonorrhœa. Occasionally a vaginal gland may become infected without the presence of the gonococcus. In these cases incision and drainage, with packing, is the treatment indicated. These cases should be taken in hand promptly, that a focus of infection may be removed before labor occurs.

Elephantiasis of the Labium.—Elephantiasis of the labium complicating labor may be an obstacle to delivery, and requires additional care on the part of the obstetrician. Such tissue would bleed readily if severely strained, and might easily become infected.

Hemorrhoids.—Hemorrhoids may prolapse during labor and become greatly swollen and strangulated, causing great suffering and delaying expulsive pains. If very hot water or ice be applied for a few moments, these tumors can often be reduced by firm but gentle pressure. Anæsthesia may sometimes be necessary to secure their reduction. Should it be impossible to reduce them, they may be ligated and completely divided by a sharp bistoury and the interior of the tumor emptied of blood and thoroughly disinfected with antiseptic solution.

The following applications to hemorrhoids after ligation and incision have been found useful:

Pure carbolic acid }
Glycerin } .... each 1 drachm.

To be applied with a piece of soft pine wood, the end of which is cut to fit the surface of the incised hemorrhoid. Bichloride of mercury, 1 : 500, may also be used, followed by the application of normal salt solution. The thermo-cautery is an excellent application, followed by free dusting with powdered boric acid.

During the puerperal period hemorrhoids should be powdered heavily with iodoform or boric acid.

Cystocele and Rectocele.—Cystocele and rectocele may complicate labor and cause confusion in diagnosis. A large cystocele may be mistaken for the fœtal membranes, and may be punctured. If careful examination be made, it will be found that the finger can be passed along the anterior vaginal wall to the cervix and the fœtal membranes distinguished at this point. A positive diagnosis may be effected by thoroughly emptying the bladder by catheter. Rectocele is rarely a serious complication of labor, and is usually readily replaced by the fingers as the head descends.

Malformations of the Genital Tract.—In some cases the genital tract retains its embryonal type, and consists practically of two muscular tubes separated in the long axis by a partition. As the embryo grows and becomes a fœtus, the partition disappears and the two halves of the genital tract are merged into one muscular and membranous canal.

When this embryonal condition persists, pregnancy may occur in one side of the double uterus, and occasionally a double vagina is present as well. As pregnancy advances, it is very difficult to diagnosticate some of these cases, as the physical signs upon examination resemble so closely those of ectopic tubal gestation. If the patient goes to term and labor comes on, the attention of the physician is usually drawn to a small tumor beside the uterus containing the fœtus, which, upon closer examination, is found to be the unoccupied half of the double womb. When a vaginal partition persists, there may be difficulty in the expulsion of the child from the comparatively small size of the vagina, and it may be necessary to sever the partition by incision.

The management of such a condition requires accurate diagnosis under anæsthesia if necessary, and such treatment as the circumstances of the case may demand. The patient's general strength should be maintained, and delivery by forceps should be promptly carried out if necessary.

Labor may be complicated by a persistent and almost imperforate hymen. In these cases the descent of the child proceeds until the pelvic floor is reached, when dilatation of the vagina and vulva is much impeded by the abnormal condition. Free incision is necessary, and if the occluding membrane is very firm and resisting it should be dissected away and the raw surface left should be treated by continuous catgut suture.

Failure of development in the cervix and lower uterine segment may complicate labor by causing failure in the normal engagement of the presenting part and long delay in dilatation of the uterus. Such cases are best treated by dilatation with elastic bags or by incision of the cervix, followed by the extraction of the child by forceps or version.

Labor may be considerably complicated by a very ill-developed condition of the vagina and pelvic floor. Under these circumstances the expulsion of the head is much delayed, and exhaustion threatens the patient. Dilatation may be carried to a certain point with safety in these cases, depending very much upon the age of the patient and the firmness and resistance of her tissues. In some, however, it is necessary to bisect the lower portion of the genital tract by double episiotomy. By this the posterior segment of the pelvic floor is allowed to recede extensively, and central laceration and tear into the bowel is prevented.. If this be done under antiseptic precautions, and if the incisions be immediately closed, a good result is obtained.

CHAPTER XIII.

LABOR COMPLICATED BY FŒTAL ABNORMALITIES.

Transverse Position with Impaction.—The fœtus may become so turned in the normal pelvis as to become impacted and spontaneous delivery impossible. One of the most common forms of this abnormality is the transverse position of the fœtus, termed shoulder presentations, or cross-birth. A cause of shoulder presentations is a relaxed condition of the uterus and abdominal walls, which allows the uterus to fall forward, and furthers the turning of the child across the pelvis.

The contraction of the pelvic brim is also a cause of transverse position of the fœtus, because the head of the child, not being able to descend readily, lodges upon one side of the pelvis, while intermittent uterine contractions tend to keep it there and gradually to bring down the trunk. Strong lateral flexion of the trunk may occasionally result in converting the presentation into a breech, gradually bringing the breech and legs into the pelvic cavity. In most cases, however, the shoulder is carried forcibly downward, and becomes firmly wedged into the pelvic brim. The arm may be prolapsed into the vagina or may be folded upon the body of the child in such a manner that it serves to increase the bulk of the tissues which block up the entrance to the pelvis.

Many of these cases occur in patients in whom the child was at first in normal position. Instead of descending into the pelvis, the head lodged in the left iliac fossa, while the first uterine contractions compressed the trunk of the child, bent it upon itself, and the head lodged at the brim of the pelvis, the right shoulder descended, and the right arm was gradually forced down into the vagina. It is a very rare occurrence for spontaneous delivery to occur in such a case. Occasionally, if the fœtus is small or the mother's pelvis large, the child may be folded upon itself and forced downward into the pelvis. If the fœtus passes the brim of the pelvis, the head will descend and may be delivered in the usual manner. This, however, happens so seldom that the case must be looked upon as one of impossible labor with a child of average size.

The left shoulder may present, the back being in front and the head of the child upon the mother's right side. It sometimes happens that the back is turned posteriorly, the abdomen of the child being toward the front and the face of the child being anterior.

The treatment of these conditions consists in the performance of version.

If the uterus is in a condition of tetanic contraction, the child being dead, decapitation or amputation of the prolapsed arm at the shoulder with cleidotomy should be performed in place of version.

Impaction of the Fœtus.—By rotation of the chin into the hollow of the sacrum, or by presentation of a parietal bone, or by breech presentation, or by a compound presentation when a hand or foot becomes wedged into the pelvis beside the head, the fœtus may become impacted, and, as a result, labor is impossible. The diagnosis of impaction is made by vaginal examination, when the abnormal presentation will be discovered; and also by abdominal examination to determine the condition of the uterine muscle. When labor is impossible, ineffectual uterine contractions produce a condition of tetanic spasm in the exhausted muscle of the womb. The expulsive portion of the uterus contracts firmly, and also retracts upon the fœtus, while the lower uterine segment becomes greatly stretched and thinned. In neglected cases rupture of the uterus occurs. The recognition of this danger is most important, and the prompt institution of appropriate treatment is necessary. These cases are sometimes complicated by extreme distention of the bladder, as the fœtus may compress the urethra and thus render the emptying of the bladder a matter of great difficulty. Unless delivery is promptly effected, the fœtus dies, and should air gain access to the uterus, putrescence will develop. Bacteria from the vagina also enter the womb, and septic infection is the result. In multiple pregnancy locking of the fœtuses may occur, producing impaction.

Treatment.—The treatment of this condition consists in relaxing the uterine muscle by anæsthesia or a full dose of opium and in emptying the uterus of its contents by that operation most appropriate under the circumstances. As the child is usually dead in these cases and the mother's danger is considerable, her interests only should be consulted.

Prolapse of the Umbilical Cord.—In transverse positions, in some contracted pelves, in polyhydramnios, in twin pregnancy, and in large pelves the umbilical cord may prolapse. This does not increase the mother's danger, but very greatly adds to the risks of the fœtus. If the cord becomes pinched between the fœtus and the brim of the pelvis, its occlusion follows and the fœtus perishes from asyphyxia. If the cord can be returned above the pelvic brim, the danger ceases; or if the cord can be kept from pressure and the child delivered with reasonable promptness, its life may be saved.

Treatment.—The treatment of prolapse of the cord consists in placing the mother in the knee-chest or Trendelenburg posture or in the right or left lateral posture, or in the dorsal posture, with the hips much higher than the shoulders. If the patient is a multipara and the vagina is easily distended, the prolapsed loop of cord should be taken in the aseptic hand of the operator and carried, if possible, above the pelvic brim. By suprapubic pressure an effort should be made to bring the head or breech to engage in the pelvic brim, thus preventing a recurrence of the complication. If the mother is a primipara, this manipulation cannot be performed in most cases without an anæsthetic. A small quantity of chloroform or ether should be given, that straining may be prevented and the cord safely replaced. Repositors for putting back the cord are of various kinds, usually a flexible hollow stem containing a stylet or rod, and at the distal extremity a loop by which the cord is grasped. The cord is pushed up by the rod, and when in position the stylet is pushed out and the cord dropped in the desired location. A stiff catheter or English catheter is sometimes employed for the same purpose.

If upon reposition the cord shows a tendency to immediately slip down, an elastic bag may be introduced and distended, thus making it impossible for the cord to drop. If a bag is not available, iodoform or aseptic gauze may be employed as a tampon instead. Where version is desirable for other reasons than the prolapse of the cord, the uterus should be emptied by this operation as soon as the cord has been carried safely above the pelvic brim. If the presenting part is low in the pelvic cavity and the cord cannot be replaced, it may be ligated, cut between the ligatures, and the child delivered as rapidly as possible.

Coiling of the Cord.—The umbilical cord may be coiled about the fœtus. Usually one coil about the neck is observed, occasionally several, with one or two turns of the cord about the shoulders. If the cord be long and the pelvis of ample size, the child may survive this complication. If the cord be short and the child fits tightly into the pelvis, sufficient pressure will be exerted on the cord to interrupt its circulation and asphyxia will follow. The effect of the coiling of the cord is to produce practically a short umbilical cord. This complication is sometimes observed when coiling is absent. When labor begins as the fœtus descends, the cord will become tense, the placenta may be partially or wholly separated, and hemorrhage and asphyxia will result. The mother may become aware of the tension upon the cord by violent movements of the fœtus during labor. In some cases these cause such pain as to bring the mother to the point of fainting.

Diagnosis.—The diagnosis of coiling of the cord can often be made during pregnancy by detecting a murmur in the cord. It is sometimes possible, with the patient at perfect quiet and in a still room, to detect by a stethoscope a hissing sound in the region of the fœtal trunk, which is faster than the uterine souffle or placental souffle or aorta of the mother, and which is slower than the fœtal heart. Considerable experience in listening to the sounds of the pregnant abdomen is necessary to detect this condition. Coiling of the cord may be inferred during labor when fœtal movements are excessively violent, when the mother complains of these movements with some faintness, and when the fœtus descends with unusual slowness, no other cause for delay being present.

Treatment.—The treatment of coiling of the cord about the child consists in freeing the child from the cord if possible, and if this cannot be done, in ligating and cutting the cord and delivering the child promptly. Usually by drawing gently upon the cord it may be sufficiently loosened to slip it over the fœtal head or over the fœtal shoulder. When this cannot be accomplished and the cord can be reached, it may be quickly clamped by two hæmostatic forceps and cut between the clamps or ligated, and the child extracted as soon as possible. When a diagnosis has been made during pregnancy, the operator must take care that labor is not unduly prolonged, and that the child descends and is delivered as rapidly as possible.

Fœtal Tumors.—Occasionally the fœtus in utero is delivered with great difficulty, or becomes impacted because of the presence of a tumor. Goitre, abdominal dropsy, enlarged spleen, sarcoma of the abdominal viscera, hydrocephalus, and the remains of a second fœtus adherent to the first may cause dystocia. Diagnosis may be difficult without the use of anæsthetics. As such a fœtus cannot live, there is no hesitation in lessening its size sufficiently to permit delivery. Embryotomy in such a way as the circumstances of the case suggest is clearly indicated.

Monstrosities.—In monstrosities the same reasoning applies, and with even greater force than in cases complicated by fœtal tumors. It may be impossible to diagnosticate between a fœtus having a tumor and a monstrosity. As each cannot live without the body of the mother, its life should be disregarded in her interests. In joined monsters impaction may occur, and emptying the uterus may become very difficult. Unless the monsters are of unusual size, Nature will usually find a way out of the difficulty with remarkable success.

Treatment.—In dealing with monsters complicating labor, the operator must act in the mother's interests only. In joined monsters that part which first presents can usually be delivered, and from this the operator can proceed to sever or deliver both, as circumstances permit.

Excessive Fœtal Size.—The overgrowth of the fœtus sometimes produces impossible labor, and makes delivery through the vagina unattainable. In other cases some one portion of the fœtal body is found excessively large in proportion to the mother's pelvis. Thus the head may be excessively firm and of more than normal breadth, and the shoulders may be larger and broader than usual. Neither of these conditions makes the child a monster, but shows development which promises an especially vigorous infant. In cases where the head presents, the physician must be careful to assure himself that engagement is present before applying the forceps. Failure of such a head to engage demands the enlargement of the pelvis, delivery by abdominal incision or craniotomy. Where excessive breadth of the shoulders prevents delivery, cleidotomy on one or both sides may be performed. In women who have in previous pregnancies had excessive development of the fœtus, something can be done to moderate fœtal size by removing meat from the diet and by restraining the patient's appetite within reasonable bounds.

Hydrocephalus.—An accumulation of serous fluid within the fœtal cranium may so enlarge the head as to render delivery impossible. This fluid may be within the ventricles of the brain when the hydrocephalus is internal, or may have accumulated between the cortex and meninges, when it is called external hydrocephalus. In some cases some of the fluid is external to the membrane. The diagnosis of hydrocephalus is made by the unusual smoothness and size of the presenting head, by its semi-elasticity, and by the great size of the sutures and fontanelles. The head cannot engage, but differs greatly in feeling from a large, hard cranium.

Treatment.—The treatment of hydrocephalus complicating labor consists in evacuating the fluid by puncture. When the head presents, the cranium must be opened by trochar, trephine, or incision. When the breech presents, the spinal canal may be opened, its membranes punctured or incised, and fluid allowed to escape in that manner. It is possible for children having hydrocephalus to survive birth, but, as they are feeble and ill-developed, no hesitation should be felt in performing craniotomy in the interests of the mother.

Intrauterine Cranial Rhachitis.—In rhachitic mothers it is not uncommon to find the cranium of the fœtus broader, thicker, and much denser than normal. The bones of the cranium do not override, as in normal labor in these cases, and the head does not successfully mould. The diagnosis is made by observing the breadth and hardness of the head and by recognizing the rhachitic condition of the mother.

Treatment.—The treatment of this condition consists in delivering the child by forceps if the head is well engaged. If engagement does not occur, then the pelvis must be enlarged or abdominal and uterine incision practised, or the operator must decide to perform craniotomy.

Premature Rupture of the Fœtal Membranes.—The fœtal membranes may be adherent about the internal os uteri through an inflammation or infection occurring during pregnancy. In some cases no adequate cause can be discovered for the premature breaking of the bag of waters.

The immediate result of this occurrence is to bring the presenting part more firmly against the lower portion of the uterus and usually to excite stronger and more vigorous uterine contractions. Dilatation of the cervix is usually retarded by this occurrence, because the dilating action of the bag of waters is wanting. If much of the amniotic liquid escapes, labor may be considerably delayed, and is said to be a dry labor.

On the other hand, if the mucous secretion of the cervix and vagina is abundant, and if the cervix is not dense and resisting, premature rupture of the membranes often results in a labor more rapid than usual.

Diagnosis.—A positive diagnosis of rupture of the membranes may be difficult, because the membranes may sustain slight rupture, part of the amniotic liquid may escape and sufficient be left to cause a second bag of waters in the place of the first. Under these circumstances, at one examination it may be thought that the membranes have ruptured, and at a succeeding examination a bag of waters may be present.

Treatment.—The treatment of premature rupture of the membranes where labor is not much delayed in consequence consists in employing artificial dilatation of the cervix. In most cases an elastic bag is best adapted for this purpose. Occasionally the gauze tampon, and less often Bossi's dilator, may be needed. In cases where the mucous secretion of the cervix and vagina is abundant and the cervix yields readily, no interference is necessary. If the patient complains of excessive pain and her nervousness is increased by the absence of the bag of waters, opium should be given in suitable form and in sufficient dose to quiet the nervous system. Dilatation will usually proceed rapidly when this drug has taken effect.

In cases where premature rupture of the membranes is accompanied by excessive rigidity and denseness of the cervix, it may be necessary to incise the cervix in several directions to permit the birth of the child. In making such incision, care should be taken to avoid the two lateral portions of the cervix at their middle, as here vessels are most abundant. Four small incisions, avoiding the top and bottom and each lateral surface, will not cause hemorrhage and will prove most efficient.

CHAPTER XIV.

LABOR COMPLICATED BY HEMORRHAGE, SHOCK AND INFECTION (INVERSION AND RUPTURE OF THE UTERUS).

HEMORRHAGE.

Hemorrhage may occur during labor from partial separation of the placenta, from laceration of the cervix, from lacerations in the pelvic floor and vagina, from rupture of enlarged bloodvessels in the broad ligaments, and from hæmatoma or extravasation of blood into the tissues of the vulva and tissue surrounding the vulva. We have already described hemorrhage following partial separation of the placenta.

Hemorrhage from a Torn Cervix.—In bleeding from tears of the cervix, usually rigidity of the cervical tissue is present, and the cervix, instead of dilating, ruptures before the advancing head. Hemorrhage is detected by a steady but slight flow of bright blood, which is temporarily lessened by the occurrence of an active uterine contraction. The treatment of hemorrhage from the cervix during labor consists in multiple cervical incision followed by the use of the elastic bag and by the delivery of the child. If the cervix is extensively torn, it must be closed by suture immediately.

Hemorrhage from the Vagina.—Hemorrhage from vessels in the vagina may precede the expulsion of the fœtus. It is seldom severe, as the vessels retract and as the pressure of the child's body speedily stops the bleeding. Should bleeding from this source be persistent, points of hemorrhage should be ligated with catgut or a fully-curved needle, with catgut suture, should be passed beneath torn vessels.

Hæmatoma of the vulva and vagina accompanying labor may occur in breech presentation, or when an especially large and firm head is delivered through an undeveloped pelvic floor and vagina. In these cases delivery should be practised as promptly and as gently as possible. Unless the hæmatoma rapidly increases, interference should not be practised; but should the clot rapidly increase in size and hemorrhage persist, the clot must be incised at its lowest point, turned out, the cavity irrigated with salt solution, and firmly packed with iodoform gauze. Especial care should be taken to prevent infection.

Intra-abdominal Hemorrhage.—Should enlarged veins in the broad ligament rupture during labor, a positive diagnosis would be impossible. Intra-abdominal hemorrhage could be diagnosticated, and careful examination should show that the source of the hemorrhage was not within the uterus. Abdominal section and ligation of vessels is the only efficient method of controlling such a case.

SHOCK.

The development of shock during labor may result from several causes: Individual susceptibility to shock varies greatly. The more highly organized the nervous system of the patient and the worse the nutrition, the greater is the liability to shock. Sturdy, well-nourished persons, stolid in temperament, bear long-continued labor with no more than usual fatigue. In other patients the element of suffering is a powerful factor in the production of shock. Pain weakens them, and as fatigue increases so pain is felt more keenly. With such patients each additional hour of labor brings increased danger of shock. Such patients are also profoundly affected by psychic influences. Grief, fear, terror, anger, and anxiety all depress them greatly. In the experience of the writer a young, neurotic, ill-nourished, and illegitimately pregnant young woman was frightened into fatal shock by the prediction of a medium to the effect that the patient would die in labor.

Hemorrhage powerfully predisposes to shock, hence every precaution must be taken to prevent hemorrhage during labor and to anticipate those conditions which cause postpartum hemorrhage and uterine relaxation. Violent efforts at delivery are potent factors in producing shock. Thus version and extraction through a highly contracted pelvis not only expose the mother to hemorrhage from laceration, but also to the dangers of shock. Prolonged and difficult delivery by forceps, when great force is applied, produces considerable shock. Rapid emptying of the uterus without violence is not followed by shock, for in Cæsarean section, which is the quickest mode of parturition, if there be no hemorrhage, there is no shock.

In complicated and severe cases shock is most likely to develop so soon as the womb is empty. The change in abdominal pressure following the removal of the fœtus causes dilatation of the abdominal veins and retrocession of blood from the vital centres, hence in conducting difficult deliveries in weakened patients the operator must anticipate shock so soon as the womb is emptied and take measures to prevent it. Infection renders shock greater, and its effect upon the patient much more serious. This is especially true if infection occurs early in labor and if the blood is infected at the time when delivery takes place.

Treatment.—The treatment of shock during labor is conducted upon the same principles applied to other surgical conditions. The early use of strychnia and ergot hypodermatically very much lessens obstetric shock. When the operator sees that delivery is about to occur, 1-10 to 1-15 gr. of strychnia, with 1-75 to 1-100 gr. of atropin, may be given hypodermatically. Two syringefuls of aseptic ergot, especially prepared for hypodermatic use, should also be administered. The patient should be kept with the head low and the pelvis much elevated. Artificial heat should be applied beneath the occiput, and saline solution introduced into the body as rapidly as possible. If abundant assistance is at hand, salt solution may be given by intravenous transfusion. Under other circumstances, hypodermoclysis or rectal injection is the best available method. The interrupted current of electricity is especially valuable in obstetric shock, one pole placed over the uterus or over the solar plexus and the other at the base of the brain. This current has a prompt and efficient effect in stimulating the abdominal sympathetic. A moderate quantity of alcohol may be injected with salt solution into the rectum. Freshly-made hot coffee is advantageous in some cases, and the inhalation of oxygen may also be practised. We have endeavored to give an idea of the comparative value of remedies to combat obstetric shock by the order in which we have described them. The physician must be warned that immediate rally from shock during labor is no guarantee that secondary shock may not develop within the first few hours of the puerperal period.

INFECTION.

Sapræmia.—By the term septic infection is understood the development in the mother's tissues during labor of necrotic material formed from the cellular elements of her tissues, or the introduction within her body of poisonous germs and their products from without. The first process is styled by some sapræmia, while the term septic infection is limited to poisoning by germs and their products. While it is important to distinguish sharply between the two, clinically cases are seen in which symptoms of poisoning follow bruising and injury of the mother's tissues, when every precaution is taken to avoid the introduction of septic germs. On the other hand, cases are not uncommon in which symptoms of septic infection are clearly defined before the termination of labor, while in others the condition develops unmistakably during the puerperal state.

In cases of prolonged and neglected labor, in which strong uterine contractions have forced the head of the child against the pelvic tissues, it is usual to observe a gradual rise of temperature to 101°, 102°, or 103° F., accompanied by a pulse ranging from 100 to 120. These cases are frequently terminated with laceration of the mother's tissues. Many of these patients are entirely without assistance and without interference as far as examinations are concerned or actual contact with the genital organs. If septic infection does not occur and delivery is secured, the temperature gradually falls, its decline being accompanied by free perspiration and without chills. The same phenomena are observed during and after prolonged and difficult labor conducted under antiseptic precautions, but terminated by instruments or by version. The most rational explanation from a practical standpoint for these cases ascribes the fever to the absorption of necrosed tissue, resulting from the mechanical injury of long-continued labor: this condition is termed sapræmia.

Treatment.—The treatment of labor complicated by sapræmia consists in the thorough observance of antisepsis and the prompt termination of labor. Lacerated surfaces should be promptly closed by suture and uterine contraction secured.

Where the tissues of the cervix, pelvic floor, and perineum have been severely bruised and lacerated, it would seem at first sight unreasonable to expect union after suture. If the patient is exhausted as the result of labor, it is well to wait from twenty-four to thirty-six hours after delivery before attempting to bring together torn surfaces. The parts must be kept thoroughly clean by irrigation with bichloride of mercury, 1: 8,000, or lysol 1 per cent., given every six hours and at as high a temperature as the patient can conveniently endure. This should be followed by free powdering with boric acid. An antiseptic dressing must be worn over the vulva. The result of such delay will be to diminish greatly the swelling in the parts and to put the tissues in much better condition after suture. After such delay the patient may be anæsthetized and the torn tissues brought together. In sewing up such lacerations care must be taken to select a suture material which will not readily cut through and to avoid tying the stitches tightly. Chromicized catgut or silkworm gut is the best material, and may be used in interrupted or continuous suture. Such stitches, if interrupted, should be left in place for ten days after their insertion. It is often necessary to remove only the knots from chromicized catgut suture if left for two weeks, as much of the fibre is absorbed.

The after-treatment of such cases, in which the tissues have been greatly bruised and torn, consists in the maintenance of strict surgical cleanliness. In using irrigation in these patients, a pitcher or fountain syringe should be employed, and, if the sutures are low in the vagina, a spray nozzle is often advantageous. Bichloride of mercury in solution sometimes causes necrosis of bruised tissue, which is seen by a grayish film which forms upon the surface. In these patients bichloride may be substituted by normal saline solution or saturated solution of boric acid. This should be followed by free powdering with boric acid. Care should be taken to catheterize the patient for two or three days after such labor, and, if the tissues about the meatus are greatly swollen, it is well to drain the bladder by leaving a catheter to which is attached a rubber tubing terminating in a basin of antiseptic solution. The bladder should be irrigated with saturated solution of boric acid once daily by injecting the solution through the catheter. The results obtained in these cases are often much better than seems probable when the serious nature of the original injury is considered.

It is well to assist the patient in getting rid of poisonous material by free purgation. In cases which have been neglected and seen amid surroundings of external filth, general cleanliness must be secured as far as possible. The vulva should be kept covered with an antiseptic occlusion dressing, which must be applied and renewed most carefully.

Acute Sepsis.—Direct septic infection occurs during delivery by direct contact by hands, instruments, or articles used about the patient. It may also be observed in cases in which the patient's body before labor has contained septic germs which have been liberated during the process of birth. Thus it is possible for a patient suffering from gonorrhœa, syphilis, or cancer to liberate germs already existing in her body, and for their absorption during labor to produce infection. This is styled septic infection. A gonorrhœal abscess in the Fallopian tube may burst during labor and rapid infection result. A chancre in the cervix or vagina may give rise to infection during labor, followed by the rapid development of sepsis. Delivery through a cancerous uterus may be followed by rapid septic absorption, with fatal results.

The symptoms of infection occurring in this way are chills, followed by sweating, fever, and a rapid pulse—from 120 to 140. The expression of the patient is depressed and anxious, and her aspect is that of beginning surgical shock. Uterine contraction after delivery is often deficient, and postpartum bleeding may occur. The predominant symptom, which is of greatest importance as indicating the treatment, is the condition of shock and depression, which is not seen in cases complicated by sapræmia. Acute septic infection may also be conveyed to the patient by germs introduced into the circulation by the hands, instruments, or appliances of those who attend her. The period of development required for these germs usually causes their first effect to become apparent from two to three days after delivery. This, however, is true only of those cases in which infection takes place in the tissues of the vulva or vagina. Where septic germs go directly into the uterus and enter the blood through the open sinuses, the condition may become apparent even before the termination of a prolonged and difficult labor.

Delivery in Acute Sepsis.—Acute sepsis occurring directly during labor is a complication of the utmost gravity. In cases in which there is reason to believe that the patient has been thus infected, the choice of a method of delivery may depend entirely upon the presence of this complication. If the uterus has become infected during prolonged and complicated labor, it is best after delivery to thoroughly disinfect and drain the uterus by gauze or so to perform delivery that the uterus shall be removed with the child. It is useless to deliver the patient by symphysiotomy or Cæsarean section, leaving a thoroughly septic uterus within the body. In cases in which the physician is summoned after prolonged and unsuccessful labor, should he find the patient infected, or should he observe a total lack of antiseptic precautions on the part of those who have examined her during labor, he will do wisely to modify his plan of delivery in accordance with these facts. Hysterectomy, or total extirpation of the uterus, tubes, and ovaries, may give the patient the best chance for recovery.

The patient's condition of shock is a valuable clinical index as to the degree of infection present and her ability to resist septic poison. As a rule, she will react more quickly and successfully if an infected uterus be removed, either wholly or in part, than if it be left behind.

The development of septic infection, arising in lesions of the vagina or perineum, is rarely complete before the second or third day of the puerperal stage, and hence the later form of the disorder will be considered under diseases of the puerperal state.

Treatment.—The treatment of septic infection during labor comprises the thorough practise of obstetric antisepsis. As most of these cases arise in patients who are debilitated by long and exhausting labor, and often in cases in which hemorrhage and injury to the birth-canal have occurred to weaken the patient, there is room for a choice in the selection of an antiseptic and the method by which it is employed. Experience has shown that in patients weakened by prolonged labor and depleted by hemorrhage mercurial poisoning is more apt to follow the use of bichloride of mercury than in the cases of patients who are in good general health. It is well to limit the use of bichloride of mercury to the hands and the appliances of the attendant, to the external portions of the patient's body, and to surgical dressings. For douching the uterus hot, sterilized water, normal salt solution, creolin or lysol, boric acid solution, carbolic acid, thymol, alcohol and water equal parts, or diluted iodine may be employed to advantage. For cleansing the vagina a combination of creolin and soap is exceedingly useful. For maintaining the uterus and vagina in an antiseptic condition, immediately after delivery antiseptic or iodoform gauze may be employed in strength of 10 per cent. of iodoform. During prolonged labor, and especially during the various stages of induced or complicated labor, the vulva should be covered by an occlusion dressing of gauze impregnated with bichloride of mercury, 1 : 4,000.

The general treatment of a patient during prolonged labor, and especially of a patient who has become infected in labor, requires an active and persistent use of stimulants and easily-digested food. Strychnine is the most valuable of tonics, and may be given by hypodermatic injection as soon as the uterus is emptied. Alcohol may be given by rectal injection in the form of brandy with beef extract, or whiskey with milk, or brandy and egg. Digitalis and atropine may be administered by injection, should any indication arise for their use. It is of the utmost importance that as labor goes on, and especially as the birth is completed, firm uterine contractions be secured. It will be found that strychnine and alcohol will often have more value than ergot in securing this result.

Fœtal Infection.—The fœtus may also become infected by sepsis during labor. In cases in which birth is prolonged, as soon as the membranes rupture septic material from the vagina may gain access to the eyes, the nose, and the mouth of the child. Children may be born with ophthalmia, with gonorrhœal infection of the mouth and nose, and with a beginning septic inspiration pneumonia. All that can be done to avoid these complications consists in thoroughly cleansing the genital tract of the mother before delivery. In cases in which infection is feared, the eyes should be thoroughly cleansed with sterilized water, followed by the use of nitrate of silver, one drop of a 2 per cent. solution. The mouth should be cleansed with saturated solution of boric acid, preferably by spray, and the nostrils may also be similarly treated. The newborn infant should be held suspended with its head lower than its body after birth, that fluid or mucus may emerge from the mouth and nose. This is best accomplished immediately after delivery by suspending the child by its feet for several minutes. Septic infection may also enter the body of the child through its umbilical cord, hence especial care must be used in dressing the cord.

Maternal Mortality.—The mortality rate of mothers who are infected by sepsis during labor itself is very high, the majority of such cases ending fatally. Where sapræmia develops, the prognosis for recovery is good, provided septic infection is not added to the complications already existing.

Fœtal Mortality.—The prognosis for children born during labor complicated by septic infection is also grave. If promptly treated, ophthalmia can be controlled, in the majority of cases, without serious results. Inspiration pneumonia and septic infection of the umbilicus are, however, usually fatal.

Autoinfection During Labor.—While septic infection arises, in the great majority of cases, from germs introduced within the body of the patient from without, there are certain conditions of the body in which septic germs are present or may be developed before labor. Cancer and syphilis in the pregnant patient expose her to acute infection at the time of parturition. Erysipelas, typhoid, appendicitis, pre-existing infection of the tubes or ovaries, and others of the acute infections expose her to a like danger. These cases are not purely autoinfection, because the original source of the disease was brought to the patient from without. They are, however, autoinfection in the sense that the germ is present before labor, and is introduced immediately into the circulation at that time.

As has been shown in treating of the disorders of pregnancy, such conditions will usually be diagnosticated and removed before the actual beginning of labor. Should, however, the physician be called to his patient for the first time when in labor, and should he find her already infected, all that he can do will be to destroy, if possible, an existing focus of infection before or at the completion of labor. Should an abscess in the appendix or in the tube rupture during labor, abdominal section must be done at once. Lesions of syphilis or cancer must be destroyed by strong antiseptic applications. Labor must be so conducted as to open as few fresh avenues for infection as possible. Every precaution should be taken to enable the patient to resist infection; and while the chance is greatly against her, still the possibility exists that she may escape fatal poison.

Intestinal Infection During Labor.—Our knowledge of bacteriology teaches us that the intestinal tract may contain bacteria which are practically harmless as long as they remain enclosed in the bowel, but which are capable of exciting dangerous conditions if they enter the lymphatics of the abdominal cavity. Chief among these is the colon-bacillus (bacillus coli communis), which is often accompanied by pus organisms and sometimes by streptococci. In cases in which obstinate constipation has existed during pregnancy, and in which gestation is prolonged and difficult, such mechanical injury may be done to the intestine or surrounding tissues as to cause these germs to gain access to the lymphatics, and thus set up a lymphangitis of the mesentery and finally a purulent peritonitis. In some cases congenital anomalies in the intestine favor the retention of fæces and the development of these germs.

The presence of these germs in the intestine before labor is often difficult to diagnosticate. Where persistent constipation with tympanites is present, their activity may be strongly suspected. A positive diagnosis can scarcely be made without a bacteriological examination of the fæces, a procedure which can rarely be carried out.

Prophylaxis.—In the presence, however, of the clinical signs described, it is of great importance that the intestine be emptied as thoroughly as possible before labor. While our knowledge of the action of drugs which affect intestinal bacteria is scanty, it is probable that mercurials followed by salines are the most efficient agents for this purpose. Calomel and soda, 2½ grains, followed by free purgation with Epsom salt, is certainly of value. Where the practitioner sees the patient some days before delivery, minute doses of bichloride of mercury followed by salines and by copious high injections should be of value. The patient's food should be selected to secure absorption from the stomach, and to leave as little residue as possible to undergo fermentation in the bowel. Broths and soups, with a small quantity of bread, comprise the best diet. Large quantities of milk should be avoided, as the curd tends to distend the bowel and favors the mechanical occlusion of the intestine.

Symptoms.—The symptoms of infection proceeding from the intestine are a rapid pulse, with but moderate elevation of temperature; great restlessness, with abdominal distention, but temporarily relieved by lavage of the stomach or intestine. If the case proceeds to a fatal issue, it is usually by the development of obstruction of the intestine from a mass of lymph poured out about the bowel. Symptoms of infection of the genital tract are wanting, the lochia is not foul, and wounds of the pelvic floor and perineum and of the abdominal wall heal promptly.

Treatment.—The treatment of this infection consists in persistent efforts thoroughly to empty the bowel. Spasmodic contraction of the intestinal wall should be overcome by the hypodermatic use of codeia in half-grain doses. One-tenth of a grain of calomel may be given every half-hour until a grain has been taken, followed by salines and by a high injection of glycerin, 1 ounce; sulphate of magnesium, 1 ounce; spirits of turpentine, ½ ounce; water, 1 quart.

The stomach should be thoroughly cleansed by lavage, and the cleansing repeated every four hours until the water returns clear. Sterile water or normal salt solution should be employed for this purpose. Abdominal section for this complication is generally useless, as the source of infection is within the bowel and cannot be removed by flushing the abdomen. This complication is, fortunately, rare, but it may be distinguished in most cases from streptococcus infection of the genital tract, and calls for especial study in prophylaxis, and also in prompt and vigorous curative treatment.

Rupture of the Uterus.—Among the most serious complications of parturition is rupture of the uterus. This accident is to be feared in all cases in which a serious obstacle to delivery is present, either in the form of contraction of the pelvis or of a malposition of the fœtus which renders the normal mechanism of labor impossible. The symptoms of threatened uterine rupture are cessation in the progress of labor, tenseness of the uterine muscle, with the gradual rising in the abdomen of the strongly marked lower edge of the upper uterine segment, known as the contraction ring. This does not become evident in normal labor, and is only present when, from long-continued efforts at parturition, the upper contractile portion of the uterus is thrown into tetanic spasm, while the lower uterine segment is excessively distended over the presenting part. The patient's labor pains, which have been severe, grow much weaker and less frequent. Her pulse rises considerably above 100, while her temperature is two or three degrees higher than normal. Her expression is that of irritable fatigue, and her complaint of suffering is almost constant.

Unless this condition be relieved the uterus will tear, usually across its anterior aspect, at the juncture of the lower and upper segments. Sometimes the continued bruising of the uterus against the promontory of the sacrum will bring about laceration upon the posterior aspect of the womb. The symptoms of this accident are sudden cessation of labor pains, with symptoms of surgical shock. In some cases actual suffering seems to cease, and the patient is relieved from her distress. In others the complaint of abdominal pain is very urgent. The presenting part may recede from its position and fail entirely to advance. Slight hemorrhage may be present, or none may be noticed.

If such a case be left without treatment, the death of the patient must inevitably follow. Delivery is impossible by spontaneous efforts, the dead fœtus undergoes rapid decomposition, abdominal infection and peritonitis follow, with a rapidly fatal termination. The conditions are favorable for the recovery of the patient in proportion to the extent of the laceration, to the amount of the fœtal body which has escaped into the abdomen, and also in proportion to the promptness and intelligence displayed in treatment.

Treatment.—The first effort of the obstetrician should be, if possible, to remove the fœtus with the least injury to the uterus. In favorable cases the head does not completely escape through the rent in the womb. The shoulder and elbow may have entered the abdominal cavity, the remainder of the fœtal body being still within the uterus. In such a case the head should be cautiously brought upon the pelvic floor, if possible, by manipulation, and the child delivered with forceps. In other cases the head and arms of the child may be within the abdomen, and the physician may find upon introducing his hand that the conditions are favorable for version. Under complete anæsthesia with ether or with chloroform, he may cautiously extract the fœtus by the breech and foot, completely emptying the uterus. In rare cases the placenta is separated from the wall of the womb and expelled into the abdominal cavity. Where this is present, the fœtus rapidly perishes from asphyxia.

TREATMENT BY VAGINAL TAMPON.—If the obstetrician can deliver the fœtus through the vagina with no additional injury to the uterus, he should make a thorough examination to determine the situation and extent of the rupture. If the uterus has been completely emptied, he may find it so tightly contracted that the laceration has been reduced to a small rent, the body of the womb remaining in good position. In these cases abdominal incision should not be practised, but the uterus should be tamponed with antiseptic gauze, the end of the gauze being carried through the rent and into the abdominal cavity. The purpose of this tampon is to provide drainage, to prevent further hemorrhage, and to seal up the abdominal cavity from septic material which might otherwise enter through the rent in the uterus. The patient's intestines should be thoroughly emptied, she should be fed small quantities of easily-digested food, and be closely watched. In favorable cases serious infection does not occur, the patient's temperature does not rise above 101° or 102° F., the lochial discharge is not offensive, and the patient makes a gradual recovery. The gauze should be removed in forty-eight hours, and the vagina carefully swabbed with antiseptic solution, the cavity of the uterus cleansed in the same manner, and the gauze packing replaced. Care should be taken to exercise no violence in reinserting that portion of the gauze which enters the pelvic cavity. An occlusion dressing must be worn over the vulva, and the external parts be kept scrupulously antiseptic and thoroughly protected. Douches should be avoided in these cases, lest the fluid employed enter the pelvic cavity through the rent in the uterus, carrying septic material or setting up an irritation.

HYSTERECTOMY.—In cases, however, where a considerable part of the fœtal body escapes into the abdominal cavity, no attempt should be made to deliver the child through the vagina, but the abdomen should be opened as soon as possible. The form of operation to be selected is that of hysterectomy, amputating the uterus at the junction of the lower and upper uterine segments, removing the tubes and closing the stump by suture. If a considerable amount of blood or amniotic liquid is found in the pelvis, it should be carefully removed with aseptic gauze or sponges and a glass drain employed for twenty-four or forty-eight hours. The child is to be extracted as best can be done when the extent and nature of the rents in the uterus are ascertained after the abdomen is opened. The effort to save the uterus by extracting the child and closing the opening with suture is attended with so much risk that the safer operation is hysterectomy. The results obtained by abdominal section in these cases depend upon the length of time which the woman had been in labor and upon the presence or absence of infection. So many of these patients are repeatedly examined during labor by infected persons, and so many of them have been in labor so long and subjected to such frequent manipulation before rupture occurs, that the interior of the womb, the amniotic liquid, and sometimes the fœtus, have all become infected before the abdomen is opened. In other cases considerable hemorrhage into the abdominal cavity has occurred. In others infection from the intestinal tract may subsequently develop, complicating the result of the operation. So many of these factors in the problem are beyond the control of the operator that the result of the operation is always a doubtful one. When, however, the conditions are favorable in the absence of infection, of severe hemorrhage, and of profound shock, patients are saved. The effort should always be made by prompt operation.

Signs of Threatened Uterine Rupture.—It is especially important that the physician recognizes signs of threatened uterine rupture. The contraction ring or edge of the upper uterine segment may be plainly felt upon palpation, and gradually rises from the pubes to the umbilicus. The irritable tonic condition of the uterine muscle, the cessation of rhythmical labor pains, gradual rise in the mother's pulse and temperature, and her evident exhausted condition should give plain and positive warning. Under these circumstances, the patient's nervous system should be immediately controlled by an anæsthetic or by opium, and the uterus should be emptied as soon as possible.

Repeated Rupture of the Uterus During Labor.—If a patient recovers from rupture of the uterus occurring during labor, still retaining the womb, she will be exposed during subsequent parturition to the danger of a second similar accident. Hence, in subsequent labors the physician should take especial precautions to avoid delay in labor and to deliver the patient as promptly as possible.

Inversion of the Uterus During Labor.—The causes leading to this accident are rapid, uncontrolled delivery with the patient in the erect or semi-erect posture, pulling upon the umbilical cord in delivering the placenta, and excessive straining and bearing down on the part of the patient during labor. The symptoms of inversion of the uterus are sudden shock, hemorrhage, and the appearance of the inverted womb protruding from the vulva. The uterus may not be recognized at once if the placenta is attached to it, or it may be mistaken for a fibroid polyp which has followed the child in the emptying of the womb.

Prevention.—The prevention of this accident is to be brought about by controlling the labor of the patient, preventing her from excessive straining and bearing down, putting her in a suitable posture, and, if necessary, employing an anæsthetic to modify the contractions of the uterus. Methods of delivering the placenta which rely largely upon traction upon the umbilical cord are necessarily dangerous, and should not be practised. In delivering the placenta by Credé's method, care must be exercised that, in pressing upon the uterus, the fundus of the uterus is not indented by efforts at delivery of the placenta. The uterus should be grasped between the fingers and the ball of the thumb and the strong portion of the hand which is developed where the thumb joins the wrist. Pressure upon the womb should be exerted from before backward, and not from above downward. In this way the anterior and posterior walls of the uterus are brought forcibly together, and the placenta is squeezed out of the uterus without indenting its wall at the fundus.

Treatment.—This accident having occurred, the first and primary indication is to replace the uterus immediately. The patient should be promptly brought to the edge of the bed or table, her thighs supported by assistants or her feet placed in chairs. If the placenta is still adherent to the uterus, it should be completely removed and the uterus and the surrounding tissues thoroughly douched with hot lysol solution, 1 per cent. If the attempt to replace the uterus causes suffering, an anæsthetic should be employed.

In attempting to put back the womb two things must be done: First, the fundus of the uterus must be indented and carried backward and then upward; second, the contraction ring, which prevents the replacing of the uterus, must be dilated at the same time that the uterus is returned to its normal position. This manipulation is best accomplished by covering the inverted fundus with several layers of antiseptic gauze to prevent injury to the endometrium. The operator then places his thumbs at the lowest point of the inverted fundus and indents, by steady and strong pressure, this portion of the uterus. With his fingers and thumbs he makes outward pressure at the same time, while with his hands he carries the uterus backward into the vagina and upward toward the brim of the pelvis. The first sign of success will be the gradual yielding of the uterine wall and its indentation. This will go on slowly until, possibly, the knuckles of the hand can be brought to press against the womb, when its restoration may follow quickly, with a sudden reverse contraction of the uterine muscle. In performing this manipulation strength and gentleness are both requisite. No sudden motion should be made, as this but irritates the uterine muscle to spasmodic contraction. Gentle, steady pressure, properly applied, will, in nearly all cases, overcome the difficulty. When the uterus has been replaced, it should be again douched with hot lysol solution, and symptoms of shock, which are usually present in these cases, will require additional attention.

Postpartum bleeding occasionally follows the replacement of the uterus, and must be met by the treatment appropriate to that condition. The danger of septic infection from this accident is considerable. The site of the placenta is exposed to direct contact with the hands of the operator and with other portions of the patient's body. If her surroundings are not clean, the opportunity for infection is thus abundant. Should rise of temperature follow the replacement of the uterus, the womb should be thoroughly irrigated with antiseptic solution.

SECONDARY REPLACEMENT.—It is sometimes impossible to replace the uterus immediately, and the services of the obstetrician may be required in consultation in a case in which the original accident happened days or weeks before he sees the patient. In these cases, if septic infection is present, the patient's best chance for life and recovery will lie in extirpating the uterus through the vagina. Clamps or ligatures may be used, and the operation is not in these cases an especially difficult one. If, however, septic infection is not present, the uterus is to be replaced by essentially the same method which would be employed were the accident a recent one. As long-continued pressure is required in these cases, manipulation without the aid of apparatus can rarely be employed. Some form of instrument making pressure against the fundus in as harmless a manner as possible must be used. Several of these have been employed successfully. Under strict antiseptic precautions, and with interruptions in the use of the apparatus, to prevent necrosis of the tissues, the womb is usually replaced in from twenty-four to thirty-six hours. The apparatus is to be applied and remain in position for six or eight hours, followed by an intermission of four to six hours.

It is often possible for two physicians to treat one of these cases successfully by making pressure and relieving each other at intervals for a period of several hours. When the pressure is not being made, a firm tampon of antiseptic gauze should be placed upon the inverted fundus and the uterus carried up as far as possible by a T-bandage. If any impression at all can be made upon the fundus, continuous pressure by a firm tampon will sometimes result in the spontaneous reversion of the uterus. This method has for its advantages the fact that the pressure is constantly under the observation of the operator while active efforts are being made, while the antiseptic tampon is a less injurious material to apply for a long time than is any form of apparatus. The hope of replacing the inverted uterus should not be abandoned until long-continued pressure at intervals, with dilatation of the constricting ring, has absolutely failed to produce the slightest effect.

OPERATIVE TREATMENT.—In addition to methods of replacement by pressure, various operations have been devised for the restoration of the inverted womb. Such consist in incising the uterus longitudinally, thus severing the collar of firm tissue, which prevents the restoration of the fundus to its normal position, and then uniting the severed walls of the womb by suture. In the hands of experienced operators, these methods frequently give good results.

Differential Diagnosis of Inversion of the Uterus During Labor.—Care must be taken that some other tumor than the uterus be not mistaken for the womb in these cases, and that also the uterus be recognized promptly and that it be not mistaken for a polyp. When a submucous fibroid has been extruded during labor, it may appear at the cervix and gradually descend to the vulva. Injudicious efforts to remove it by traction may result in inversion of the uterus, or, if the fibroid be mistaken for the womb, an effort might be made to push it upward into the pelvis. Occasionally a submucous fibroid is mistaken for the second of twins, and its expulsion is supposed to be the conclusion of a twin labor. It is a safe and positive rule that the physician should not pull upon any tissue appearing in the vagina or at the vulva during labor unless he is absolutely certain of its nature.

CHAPTER XV.

SUDDEN DEATH DURING AND AFTER LABOR.

The parturient patient may die suddenly from shock from one of several causes—rupture of the uterus, bursting of engorged veins in the pelvis, rupture of a cystic tumor obstructing labor, and sudden cerebral hemorrhage may speedily cause death. Heart failure has been observed in patients greatly debilitated and dying suddenly. Profound mental emotion has also caused death in women in labor who have suddenly been greatly frightened or have had recent shocking news. Sudden anæmia of the brain has been observed to cause death in cases in which hemorrhage had weakened the patient and where the patient suddenly assumed the upright position.

Heart Clot.—One of the most frequent causes of sudden death during or immediately after labor is heart clot, of which the most common variety is pulmonary embolism. The predisposing causes of this complication are hemorrhage or profoundly depressing circumstances. The symptoms are sudden anguish referred to the heart, with threatened asphyxia and rapidly failing circulation; the pulse on one or both sides becomes scarcely perceptible; the countenance is pallid, while cold perspiration breaks out upon the face and the patient's expression is one of great suffering and terror.

It is possible in some cases to save life by the most prompt and vigorous stimulation. Ether is usually the most convenient and prompt stimulant which can be given. It must be administered by hypodermatic injections over the heart, and repeated until the effect is noticed. Strychnine and digitalis are indicated, but are slower in action. If an electric battery is available, the interrupted current should be passed from the base of the brain to the region over the heart. The limbs should be rubbed vigorously from below upward and external heat applied liberally. Ammonia has been advised as tending to dissolve the forming clot. Whether it acts in this way or not is not definitely known, but its stimulating properties are of value. Counter-irritation is also of service.

While these cases demand the most prompt and vigorous treatment, the prognosis is most grave. The majority of cases prove rapidly fatal.

The possibility of this complication should lead the physician to forbid his patient to sit up suddenly in bed or to be moved suddenly from one position to another. Many cases of this complication have followed a sudden change in the patient's posture.

Sudden Death in Eclampsia.—During eclamptic convulsions a patient may die suddenly in labor. It may be difficult to recognize at the moment of death the exact cause which produces it. On autopsy, cerebral hemorrhage or rapid dilatation of the heart is found to be the immediate cause. A rapidly rising temperature, with profound coma, is observed in these cases. Nothing can be done to avert this accident except such treatment of eclampsia as is most vigorous and successful. Sudden death depends in these cases upon the degeneration of the vessels of the heart or brain, a condition which is not amenable to treatment.

Sudden Death without Apparent Reason.—During labor the patient may suddenly expire from a cause which gives no sign of its nature. Autopsy in some cases does not clear up the mystery, and failure of the vital centres must be ascribed as the cause. In some of these cases death apparently threatens the patient, but her life can be saved by vigorous stimulation. In these we must suppose that a hysterical element is present.

Immunity from Death from Anæsthesia.--Parturient women endure anæsthesia exceedingly well. Carefully studied cases where death has occurred during labor from the anæsthetic only have not been recorded. An explanation for this fact may be found in the stimulation to the action of the heart and to the vital centres which parturition produces. This enables parturient women to take anæsthetics, carefully given, with less danger than is seen in the cases of other patients. While this condition affords no excuse for the careless use of anæsthetics during labor, it should encourage the physician to operate in difficult cases under anæsthesia. In spontaneous labor anæsthetics are safe and most desirable.

Treatment of the Fœtus in Sudden Maternal Death.—In the presence of sudden maternal death, the physician's duty is to save the fœtus if possible. A distinction must be made between those cases in which the child is diseased from the same cause which destroys the life of the mother and those cases in which the child does not share in the mother's pathological processes. A good example is afforded in cases of cardiac disease in which the mother perishes during labor. Here the fœtus does not share in the condition, and if it can be delivered promptly there is no reason why it should not live. In severe toxæmia and eclampsia in which the mother perishes, her child, even if delivered alive, has not the same prospect of survival.

In choosing a method of delivery in these cases, the physician must be guided by the circumstances present. If the head is upon the pelvic floor, or if the child is in breech presentation and the body has been partially born, the child can best be extracted through the vagina. If the presenting part is not engaged and the cervix closed, abdominal section should be practised. Before proceeding to operate, the heart sounds must be distinguished, and must be found to be of average strength and vigor. In dealing with these cases, it is well to remember the religious beliefs of many patients regarding the baptism of infants. Wherever possible, baptism should be procured when infant death threatens, in deference to the belief of the parents.

PART III.

THE PUERPERAL STATE.

SECTION I.

THE PHYSIOLOGY OF THE PUERPERAL STATE.

CHAPTER I.

INVOLUTION.

The puerperal state, or lying-in period, embraces the recovery of the mother from the completion of labor to the time when the genital tract has returned very nearly to its former condition and the patient is able to assume the care of her child and her usual occupation.

Duration.—The duration of the puerperal state depends upon the absence of septic infection, the presence or absence of lactation, the character of the patient's labor, and her general vigor. It is impossible to state a definite limit to this period.

Involution.—The process by which the genital organs recover from the hypertrophied condition of pregnancy is termed involution. It is characterized by the breaking down and absorption of muscular fibres, by the discharge through the vagina of the disintegrated cells of the decidual membranes, and by the return of the birth-canal and abdominal muscles to the firm and elastic condition which was present before pregnancy occurred. The discharge which occurs from the vagina during this period is termed the lochia.

The Lochia.—The lochia has usually been called sanguinolent, serous, and mucous, or, in accordance with its prevailing color, red, watery, and whitish. Its constituents vary in accordance with the time in the puerperal period at which the examination is made. In fifteen cases of parturition in which patients had no fever and made normal recoveries, the writer collected the lochial discharge by Döderlein's tubes. These tubes were immediately sealed and sent to the pathological laboratory of the Jefferson Medical College for examination. The microscopic examination of these specimens showed a few leucocytes, erythrocytes, lymphocytes, granular *débris*, and shreds of fibrin. Upon bacteriological examination, staphylococci, pyogenes albus, and aureus were present. In some cases sarcinæ citreus, bacillus megatherium, and bacillus subtilis were also present. In one specimen the aspergillus niger was found. In none of these cases were streptococci present. These patients were delivered under antiseptic precautions, were not given douches during the puerperal period, but wore antiseptic dressings and the external genital organs were carefully cleansed with antiseptic solutions after the bladder and bowels had been emptied. In operative cases treated under antiseptic precautions the lochia remains normal. Thus, in one case of neglected labor with contracted pelvis, for which it was necessary to do craniotomy, microscopical and bacteriological examination of the lochia showed no variation from the results already stated.

The death and maceration of the fœtus makes no essential change in the lochia, provided that infection does not occur from without and the case is treated under antiseptic precautions. In two patients delivered of dead and macerated children under antiseptic precautions the lochia was found to be that already stated in normal cases. All of these patients made good recoveries, uncomplicated by fever.

FIG. 142.

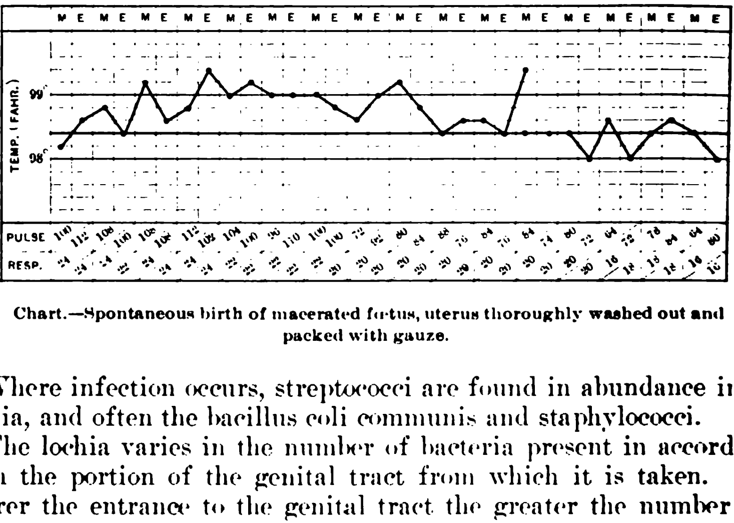


Chart.—Spontaneous birth of macerated fœtus, uterus thoroughly washed out and packed with gauze.

Where infection occurs, streptococci are found in abundance in the lochia, and often the bacillus coli communis and staphylococci.

The lochia varies in the number of bacteria present in accordance with the portion of the genital tract from which it is taken. The nearer the entrance to the genital tract the greater the number and variety of bacteria. In the upper portion of the uterus few germs are present in uninfected cases, while within the cervix in normal cases are found the germs already mentioned, but not in large quantities. In the vagina bacteria are more abundant.

The presence of lacerations in the genital tract changes somewhat the character of the lochial discharge. Leucocytes are abundant where granulated wounds are present, and pus-forming bacteria are found in large numbers. Where lacerations have been closed by suture under antiseptic precautions, the lochia remains normal in composition.

The quantity of the lochia varies considerable in different patients and under different circumstances in the same patient. Brunette women, in whom all glandular secretions are abundant and who menstruate freely, have a more copious lochial discharge than blonde women, in whom secretion is less active. In all patients the lochia is much lessened at the time when the secretion of milk is established. This period varies from one to two days, and is often accompanied by a rise in temperature to 100° F., and occasionally to 101° F. As the secretion of milk becomes established and is discharged freely, the lochia returns to its normal quantity.

The lochial discharge has a peculiar and characteristic odor, which is derived from the secretions of glands at the entrance of the vagina. The greater the care exercised in antiseptic cleanliness the less will be the odor present. This varies somewhat in accordance with the temperament of the patient. With the employment of antiseptic precautions, the odor peculiar to pus is not present in the lochial discharge, and no characteristic odor should be detected in a room containing a puerperal woman.

Cases are sometimes seen in which the lochial discharge becomes offensive in odor, but in which the patient in other respects does well. In these cases bacteriological examination shows that comparatively harmless bacilli producing odors are present, but that pathogenic bacilli, as streptococci, are absent. The presence of odor in the lochial discharge does not necessarily imply the presence of streptococcus infection, for in many cases of fatal infection the lochia does not become odorous.

Pulse, Temperature and Respiration.—The pulse, temperature, and respiration of a healthy puerperal woman differ but little from those in ordinary health. The pulse rate decreases immediately after labor, but rarely falls below 65. The temperature may range from 99° to 100° F., but in healthy patients does not exceed this limit. The respiratory rate is virtually that of a healthy woman who lies in bed. The secretions become fully established as soon as labor ceases. While during labor it is not uncommon for a patient to secrete but little urine, the amount increases gradually after delivery, as does also the percentage of solid matter contained in the urine. The bowels rarely move spontaneously with sufficient freedom to remove the fæces which accumulated during pregnancy. When, however, the intestine has been thoroughly unloaded, in healthy women the digestive organs act with regularity and vigor.

The Nervous System.—Immediately after the expulsion of the child the puerperal patient frequently has a rigor or chill. This depends in severity upon the susceptibility of the patient's nervous system to excitement, upon her exhaustion, and upon the severity and duration of the labor. The temperature of the room has some influence upon this phenomenon, as patients in a very warm room experience less reaction than those in a lower temperature. This rigor disappears when the body is covered warmly or when a mild stimulant, as a cup of hot tea, is given.

Many puerperal patients perspire freely until after the secretion of milk is well established. The nervous system of the puerperal woman is commonly extremely sensitive to disturbances of an emotional nature. Fright, grief, or anger create profound disturbances, often accompanied by sudden fever. In healthy patients, however, the puerperal period is commonly a time of contentment and happiness. The appetite of the lying-in woman is rarely good until after the emptying of the intestine and the establishment of the secretion of milk. When, however, the flow of milk is abundant and is well taken by the child, the patient commonly enjoys food and takes it with avidity. The return of general strength and vigor varies greatly in different individuals.

The Slow Puerperal Pulse.—Much interest has attached to the remarkable slowing of the pulse of the puerperal patient seen in many cases. Various causes have been given for this phenomenon, none of which is entirely adequate. The change in the distribution of blood following the emptying of the uterus and the passage of blood into the large veins, the exhaustion of the patient, the perfect quiet in which she is kept, and her recumbent posture are undoubtedly some of the causes of this phenomenon. Yet patients vary greatly in the pulse rate, and in some the pulse remains from 80 to 90 beats during the entire period. Where it is necessary to use tonics or stimulants during the puerperal period, as strychnia or other tonics, the pulse is often quicker than in cases where these substances are not given. The free administration of ergot is sometimes followed by remarkable slowing of the pulse. This phenomenon should occasion no anxiety, provided the volume and tension of the pulse remain good.

Factors Essential for Good Involution.—In order that a patient may recover well from childbirth, and that involution may proceed normally, she must be uninfected, lacerations must be closed by suture, the function of lactation must be normally performed, the patient must not be weakened by hemorrhage nor by great disturbance of the nervous system, while the functions of digestion, assimilation, and excretion must be completely and thoroughly maintained. When we consider the varying constitutions of different patients and the different circumstances under which they are confined, and the varying degrees of intelligence and antiseptic cleanliness shown in caring for puerperal patients, it is not surprising that great differences should exist in the puerperal recovery.

No definite time can be fixed at which all patients should leave their beds and assume their former occupations. As a rule, however, a full month is needed after childbirth before the mother is able to assume her ordinary duties and superintend the care of her child. In perfectly healthy patients the first efforts to sit up or to stand are followed by no disagreeable sensations beyond those of ordinary weakness. In nervous women and in frail and delicate women the complaint of backache will often be made, and demands the attention of the physician.

If the pelvic floor and vagina are in good condition and the uterus is small and in proper position, backache must be looked upon as a neuralgic pain, demanding rest and improvement in nutrition. Where, however, an anatomical cause for this distress is present, the removal of that cause will be followed by recovery.

The general health and recovery of a puerperal patient will depend in a very large degree upon the intelligence displayed in her care by her attendants and by the patient herself. Perfect cleanliness, absolute quiet, and regularity are of the greatest importance. If the patient and her friends are not sufficiently intelligent to understand this, her nurse must secure these advantages for her patient if possible.

CHAPTER II.

LACTATION.

The puerperal state is also characterized by the establishment of a new function, that of lactation.

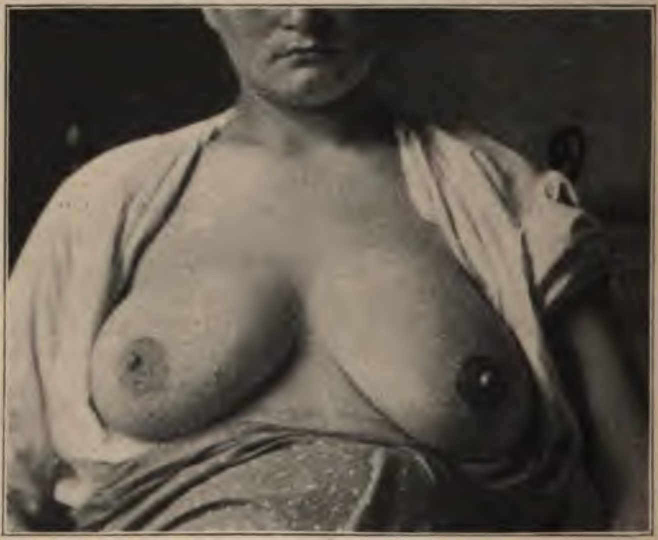
As pregnancy advances the acini of the mammary glands develop and become filled with granular cells, known as colostrum corpuscles. These are gradually supplanted by fully-formed milk globules when the secretion has become established. The duration of this process varies in different patients, but the secretion of milk is usually established in from three to five days after the birth of the child.

Those patients perform the function of lactation most successfully who have well-formed breasts, containing an abundance of glandular tissue, whose processes of nutrition are good, who assimilate and excrete well, and in whom the nervous system is naturally tranquil and not easily disturbed. Young patients often have an abundance of milk, provided the development and constitution of the patient are normal. The extreme of temperament is not favorable for successful lactation, as very blonde or very dark patients often do not nurse children so well as those in whom temperament and complexion are not exceedingly marked. In some cases racial peculiarity exists, and healthy negro women of the genuine type often perform lactation most successfully.

The function of lactation has an important influence upon the patient's recovery, aside from the supply of milk for the child. The stimulus which the development of the breasts and the child's nursing occasion aids considerably in the contraction of the uterus. In a healthy mother the patient's general nutrition is promoted by a successful establishment of lactation, and although the patient may lose weight while nursing her child, still her general condition will be improved. Conception occurs but rarely in nursing mothers, and hence a new tax upon the mother's strength is avoided. Some assert that repair of a sutured perineum and pelvic floor goes on less successfully in women who are nursing than in those who do not. There can be no question, however, that the general involution of the genital tract is promoted by lactation.

The Phenomena of Lactation.—In some patients milk is present in the breasts during pregnancy, and considerable enlargement of the breasts occurs, with painful sensations. In others the breasts are but little altered during pregnancy, and give rise to little disturbance. The first fluid secreted by the breasts, called colostrum, is a watery fluid, containing an abundance of partially-formed epithelial corpuscles from the ducts of the mammary glands. Staphylococci are present in a considerable number of cases in the first fluid which comes from the breasts. In examining a series of patients, the writer found that the fluid first obtained after birth contained staphylococci in abundance. These patients developed no mammary infection, and had normal puerperal periods. It is impossible to state definitely the source of these germs, but their presence has been confirmed by investigations made by others.

FIG. 143.



Primiparous patient with full pendulous breasts and abundant supply of milk. (From original photograph.)

Usually within three days after the birth of the child the breasts become much enlarged, swollen, and more or less hard and tender. In women of very sensitive nervous system the breasts may be exceedingly tense and very painful. The tissues about the mammary glands and beneath the angles of the jaws, the axillary lymphatics about the clavicle, and even those beneath the lower jaw may become swollen and tender. A rise of temperature to 101° F. may occur, and the patient may be excitable and even hysterical for a short time.

Composition of Breast Milk.—As secretion becomes established, the character of the fluid secreted gradually changes. It is often at first yellow, with consistence of cream, and when fully formed has a peculiar solid-white color, and leaves a faint film upon the side of a glass. Considerable fat, in the form of cream, rises from a normal specimen of human milk. Rotch's analysis of fully-developed normal breast milk is as follows:

Fat	4
Sugar	7
Proteid	1.50
Ash	0.15
Total solids	12.65
Water	87.35
	100.00

It is slightly alkaline in reaction. Microscopic examination shows its fat globules small and even in size, and the fat in a state of perfect emulsion.

We have no method of exactly measuring the quantity of breast milk in a given case. By weighing an infant before it nurses and then allowing it to nurse until it seems to empty a breast, and again weighing it, we may obtain an approximate idea of the contents of one breast. In the writer's experience this method gave from 4 to 6 ounces as the probable amount in a healthy nursing breast. As milk becomes fully secreted, the hardened areas in the breast disappear. The breast remains of even consistence, and milk flows freely upon slight pressure. The nipples, which at first may have been imperfectly drawn out, become prominent, the superficial epithelia of the nipple disappears under the child's suction and a new growth of epithelia takes its place.

Causes Influencing the Secretion of Milk.—We have already alluded to the influence which temperament has upon the secretion of milk. Certain influences which affect the nervous system have a remarkably powerful influence on lactation. A sudden fright or profound emotion has checked the secretion of milk, and in some cases has so altered its composition that the child was made severely ill by it. Continued worry greatly lessens the secretion of milk, so does cold or heat when it becomes depressing. Scanty nourishment has less effect than might be expected, as often poorly-nourished women have an abundance of milk. In these cases the secretion is apt to be deficient in solid nutritious material.

Foods best adapted to promote the secretion of milk are fresh milk from other animals, a liberal quantity of fat in cocoa, butter, cream, olive oil or fat from meats, a free supply of starch in bread, and those vegetables and fats which are most digestible and which contain sugar, or which contain starch, which may be converted into sugar within the body. When an excessive quantity of solid food is taken and the mother's digestion is overburdened, the secretion of milk is impaired. Failure to exercise and to take fresh air also lessen the quantity and injure the quality of the milk. Reasonable exercise increases the solids in milk, making it more highly nutritious. Excessive exercise and fatigue lessen the nutritious material in milk. The plentiful use of water is necessary to promote the free secretion of milk. The suction of the child is a powerful factor in stimulating the secretion of milk. This may be partially imitated by the use of the breast pump.

CHAPTER III.

THE MANAGEMENT OF THE PUERPERAL STATE.

Antiseptic Precautions.—In addition to strict cleanliness in everything which pertains to the patient, antiseptic precautions are imperative. Douches after labor are unnecessary and harmful. In cases where no sutures have been taken, the external parts only should be thoroughly cleansed with bichloride of mercury solution, 1 : 4,000, or lysol, 1 per cent., after each micturition and defecation. Sponges should never be used for this purpose, but absorbent cotton, cheesecloth, or clean old linen is permissible. The nurse should thoroughly cleanse her hands before cleansing the patient, and having placed beneath her a receptacle for the fluid and having thoroughly cleansed her hands with soap and water and bichloride solution, 1 : 2,000, the nurse should separate the labia with the thumb and finger of one hand, while the other grasps a handful of cotton or linen soaked in bichloride solution and, holding it above the parts, squeezes out the fluid, which runs over the labia. In this way the parts can be showered with the antiseptic solution and the discharge washed off without inserting the finger or disturbing the tissues. Many nurses prefer to cleanse the parts by pouring antiseptic fluid upon them with a small pitcher. If small lacerations exist, they should be freely powdered with boric acid or, in hospital practise, with iodoform.

An antiseptic dressing over the vulva is of great importance, and should not be difficult to obtain. One of the best and cheapest materials for this purpose is the cheapest quality of cheesecloth. This may be boiled in water containing sodium bicarbonate, thoroughly rinsed, and soaked in bichloride of mercury solution, 1 : 2,000. It may be wrung out, dried and baked, and used in convenient folds as an absorbent dressing. If moderate expense is not an object, bichloride gauze may be cut into suitable strips, which are folded double; between the layers borated cotton may be laid, forming a soft, thoroughly clean dressing. In hospital practise oakum or jute may be evenly carded and made into pads covered with cheesecloth. If no material but clean linen is available, this may be torn into convenient strips, wrung out of bichloride solution, 1 : 2,000, baked and used as a dressing. Cheap cotton batting soaked in bichloride is often useful, placed between the folds of old linen or cheesecloth.

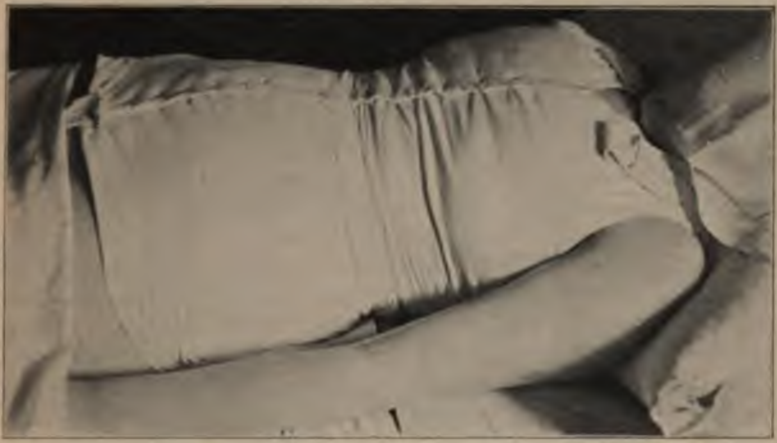
All soiled dressings during the puerperal state must be burned. The practise of washing out or rinsing napkins and again using them is dangerous and dirty in the extreme. If a soiled napkin be rolled tightly in a piece of paper, it can be burned in an ordinary range or stove. The patient's body and linen should be absolutely clean. A rubber sheet is necessary over the mattress, and above this a draw-sheet, which should be frequently renewed.

The Care of the Breasts.—The care of the breasts requires also the direct use of antiseptic precautions after labor. The breasts should be thoroughly washed after labor in soap and water and in plain water, and then in bichloride solution, 1 : 4,000. Before and after nursing the nipples and the child's mouth should be thoroughly cleansed with saturated solution of boric acid. The best of sterile surgeon's lint or sterile old, soft handkerchiefs should be saturated in boric acid, wrung out, and laid upon the nipples. The breast binder, with shoulder pieces, should be applied as soon as the breasts begin to fill, and is useful in keeping the dressings in place. The abdominal binder, while not necessary in strong women, gives comfort to the average patient by keeping the abdominal muscles quiet.

The breast binder is made of unbleached muslin which has been washed so that it is pliable, and should be wide enough to cover entirely the distended breasts, and long enough to pass about the patient over the breasts and to button or pin comfortably in the median line of the body. It should be hemmed, and, if desired, buttons and buttonholes should be added at the point of meeting. If it is desired that the bandage should fit smoothly, a V-shaped piece must be taken out at the lower border in the axillary space or the bandage should be fitted to lace at these points. Two shoulder straps of double thickness, of unbleached muslin, three or four inches wide, should be sewed to the upper edge of the bandage at the part which will come upon the patient's back at her shoulders. These should be brought over the shoulders, crossing in front or behind, preferably the latter, and should be left free to be pinned to the anterior and upper edge of the binder. By varying the point at which these are attached in front, the nurse can alter the direction of tension on the bandage, thus raising and carrying the breasts toward the center line as the varying size and distention of these organs indicate. Some have cut holes in the bandage over the nipples the size of a quarter of a dollar and have hemmed the edges of these apertures, thus allowing the nipple to protrude and the child to nurse without unfastening the bandage. Unless the edges of these holes are hemmed, the weight of the breast will cause the nipple to protrude more and more through the apertures, and will gradually split asunder the bandage, tearing the cloth and causing a prolapse of the breast. The nipple should not be left uncovered to come in contact with the clothing, but should be protected, as indicated, with clean, soft linen, soaked in boric acid solution. Others prefer not to have the holes for nipples in the bandage, but to unfasten the bandage at each nursing. If it is necessary to make considerable pressure upon the breast, a thin layer of borated cotton may be placed over the breast and the bandage applied over that. The breast bandage is not only a suitable protection and means of maintaining antisepsis, but it is a great comfort to the nursing woman, and very efficient in preventing engorgement of the breasts and the discomfort which this condition causes. The routine use of this bandage and dressing for a considerable time, in the experience of the writer in hospital and private practise, has greatly diminished the number of cases in which the patient experienced suffering from the breasts, and has made the occurrence of mammary infection, even in hospital cases, very rare.

The Abdominal Binder.—The abdominal binder should be wide enough to extend from the pubes to the umbilicus, and long enough to encircle completely the patient's body. It should be made of unbleached muslin which has been washed, two thicknesses being required unless the cloth is unusually heavy; and it may be equipped with buttons and buttonholes and with lacings, or may be fastened by pins, gathered at the sides to fit the patient's figure. It should be applied as soon after labor as the physician is sure that uterine relaxation and hemorrhage will not occur. It should be pinned from above downward, care being taken to bring the uterus into the median line and downward to the brim of the pelvis before compressing the womb with the bandage. It should be pinned smoothly and sufficiently tight to keep the patient's abdominal walls reasonably quiet. Where the uterus is unusually large, a compress of antiseptic gauze, of sufficient size to cover the womb and sufficiently thick to increase the pressure at that point, may be laid above and upon the uterus before the binder is fastened. To the lower edges of the binder in front and behind there is fastened a strip of antiseptic gauze or of clean linen, which serves to maintain the occlusion dressing over the vulva in position. The patient should have several binders, in order that they may be frequently changed and kept thoroughly clean. The advantages of the use of the binder are that the patient's muscles, which have been stretched to their utmost during labor, are supported during involution; that distention of the abdomen by gas in the intestine is less frequent; that the uterus is kept in better position at the brim of the pelvis, and that a convenient support is given to the appliances for maintaining an occlusion dressing over the vulva. The disadvantages of the abdominal binder are that, in a patient who has not a competent nurse, it may obscure the condition of the uterus and prevent the detection of a hemorrhage; that if improperly fastened from below upward, it may carry the uterus out of the pelvis and further relaxation and hemorrhage; and that it may, through failure of cleanliness, become an added source of risk from its contaminating presence. These objections, however, are more than outweighed by the advantages which the binder possesses when used in competent hands.

FIG. 144.



Puerperal patient with complete dressings. (From original photograph.)

Intestines After Labor.—The emptying of the intestines after labor should be taken in hand on the second day. It is well to give a suitable pill at evening and follow it the next morning by a copious rectal injection of soapsuds, one quart; castor oil, two ounces; spirit of turpentine, one tablespoonful, beaten with the yolk of a raw egg.

Among the pills which have been found useful in the puerperal state, Barker's postpartum pill, so called, often serves a useful purpose. Its formula is as follows:

Compound extract of colocynth	grs. 20.
Extract hyoscyamus	grs. 15.
Powdered socotrine aloes	grs. 10.
Extract nux vomica	grs. 5.
Podophyllin Ipecacuanha	each gr. 1.

In twelve pills: two to be taken at night.

Where the tongue is furred and coated, the compound cathartic pill of the United States Pharmacopœia may be given at night, followed by a saline in the morning. Calomel, grains $1\frac{1}{2}$, with bicarbonate of soda, may be taken in powder or in capsule at night, followed by citrate of magnesia in the morning. Where a tendency to catarrh of the intestine is present, the compound rhubarb pill of the Pharmacopœia is useful. Where the milk comes in with great freedom and the breasts are much distended, the free use of salines for two or three days is especially valuable. Citrate of magnesia may be used, Hunyadi water, Rochelle salt, or Carlsbad salt, as the habit of the patient will permit. The patient's bowels will rarely be emptied efficiently by a single medication, and it will be necessary to give repeated attention to this matter during the lying-in period. After the supply of milk is established and the bowels have been thoroughly moved, the patient will do well to use cascara sagrada, followed by rectal injections of soapsuds at a temperature sufficiently cool to stimulate the bowel. Chronic constipation can be avoided better by the use of cold injections than if hot enemata are taken habitually. Extract of nux vomica may be taken during the lying-in period, either alone or combined with aloes and belladonna, to maintain the contractile power of the intestinal muscle. As the puerperal period advances, fruit may be added to the diet of the patient and other articles of food which will tend to lessen the danger of obstinate constipation. The patient should not lie habitually upon her back, but turn frequently from side to side, and after the first ten days or two weeks she may leave her bed and use a commode to have the bowels opened, with considerable advantage. As soon as it is possible to employ massage, the intestines should be carefully treated in this manner, which will assist greatly in preventing the retention of feces. Intestinal torpor is exceedingly common in the puerperal state, at times annoying, because it interferes with the patient's appetite and prevents the assimilation of food, which is so much needed. In selecting laxative drugs, those should be chosen which are least likely to disturb the infant by transmission through the mother's milk. At the same time the mother is rarely constipated without the child sharing in her difficulty, and in such cases sufficient of a laxative drug is usually obtained through the milk to act favorably upon the child. Those drugs which are most apt to affect the infant are the active purgatives, and especially those which produce an irritation of the intestine. Salts pass also into the milk, but often with less irritation of the bowel of the child than do the more drastic drugs. If the diet be carefully selected and if the patient be given plenty of water, much can be done to avoid constipation without the use of drugs.

General Massage.—The action of the skin is to be maintained by a daily sponge bath. Whenever possible, gentle massage may be begun as early as the second week after labor. This may be gradually increased until an hour's time is occupied. Although massage is a luxury and subjects the patient to additional expense, it is the most useful agent in promoting the prompt and complete recovery of the patient.

In using massage in the treatment of puerperal cases, it is very important that massage be practised very gradually. At the end of the first week, if the patient has done well, massage may be applied to the limbs and to the back only. In rubbing the legs and thighs, massage should not be applied higher than the middle of the thighs, in order to avoid any danger of injuring the veins in the femoral region. As soon as the patient becomes accustomed to the treatment and it is seen to agree with her, massage may be gradually extended over the body, the abdomen being rubbed over the intestine only. The course of the large intestine will be followed, and in this way constipation will be very considerably lessened. The small intestine should also be lightly rubbed, but massage should not be applied over the uterus before the end of the second week. At this time, while the uterus should not be kneaded, light rubbing over the womb not only does no harm, but will act as a stimulus to a proper involution. If the patient requires every precaution to secure proper nourishment, olive oil or cocoa butter may be used in giving massage, with a positive gain in promoting the patient's recovery. Massage should be preferably taken in the morning, and after the treatment the patient should be kept perfectly quiet for at least an hour, in the hope that she may drop asleep.

Massage of the Breasts.—Massage may be applied to the breasts when they are overdistended, and in the absence of any signs of infection and inflammation. The hands of the masseuse should be carefully washed with soap and water, thoroughly rinsed, and then scrubbed in bichloride solution, 1 : 2,000. The surface of the breast should be made clean and sterile. Olive oil should preferably be used as a lubricant to the skin. The massage should be applied to the breasts by gentle stroking motions directed from the periphery toward the nipple. The breast should be gently raised and held as nearly as possible perpendicularly to the surface of the body. Engorgement in the breast caused by overdistention of the milk ducts can usually be efficiently relieved in this manner. Should, however, this massage be painful to the patient, it must be discontinued at once. During the fourth week full massage, with muscle kneading, may be applied to the limbs and back with positive advantage, although the treatment should be limited for the abdomen to rubbing only. In the case of nervous and anæmic women there is no method of treatment so successful in promoting involution and recovery from labor. Like all other methods of treatment, this must be employed with discretion, when it is most beneficial.

Rest and Nutrition.—Especial care must be taken to secure for lying-in women an abundance of rest and sleep. The first rest which the mother takes after labor should not be disturbed to nurse the child. When nursing has begun, the child should be fed at regular intervals of from two to three hours. Between the hours of ten at night and six in the morning the child should nurse but once. While the room should be dark while the patient sleeps, it is a mistake to keep the mother in a darkened room. Sunshine and light are necessary for proper nutrition. The patient's diet must be nutritious and easily digested. She should be fed at least four times in the twenty-four hours.

It is unwise to confine a puerperal woman to a liquid diet that more milk may be secreted. The most digestible forms of meat, raw fruit, well-cooked vegetables, and cereals may be used to advantage, with milk; plenty of water must be taken, while cocoa and weak breakfast tea may be allowed.

The diet most suitable for patients after labor consists first in broths, soups, milk-toast, milk, junket, and, if desired, a small quantity of freshly-made English breakfast tea or one cup of weak coffee daily. The patient should be limited to this diet until the bowels have been thoroughly moved, and the secretion of milk has become well established. When this has occurred, the most digestible solid food, in the form of soft eggs, lamb chops, fish, and birds, may be taken once or twice daily. An abundance of cooked fruit or of perfectly ripe raw fruit in season will be found advantageous. Gruels, fine hominy, whole wheat, cracked wheat, or oatmeal may be taken once or twice daily to advantage. Ripe vegetables in season, suitably cooked, furnish a welcome addition to the dietary. No pastry or indigestible articles should be allowed. Tapioca and rice pudding may be taken once daily with benefit. The patient should take an abundance of water, the effervescing waters furnishing a very agreeable addition to the diet.

Although the needs of a lying-in woman for nourishment are very pronounced, still the mistake must not be made of overtaxing her digestion. If the tongue is furred or coated and a tendency to constipation is present, the diet must be limited until the condition of the digestive tract and the appetite warrant its increase. Patients are sometimes seen who have suffered from obstinate constipation during pregnancy, and in whom the intestine is slow in resuming its normal activity. In these cases milk and cream peptonized by the cold process furnish a useful substitute for meat. In very warm weather the most simple kinds of ice cream, allowed to become soft, are most grateful. Women of weak digestion seldom do well on alcoholic stimulants, and these substances are very rarely needed during the puerperal period. Women are occasionally seen, however, in whom a small quantity of wine or beer seems most beneficial in promoting digestion and strength. The belief exists that tea and coffee have considerable influence in determining the amount of milk secreted. It is very doubtful whether this rests upon any accurate observation, or whether it is more than a domestic tradition which should not be allowed to influence the physician in charge. While the tendency formerly was to underfeed puerperal patients, the digestion and the diet of each woman after labor require careful and individual supervision.

The Regulation of Nursing.—For the first twenty-four hours after its birth, the mother should nurse the child every four hours. She may remain undisturbed during the night six hours if she can sleep. During the second twenty-four hours she should nurse the child every three hours, and after the second twenty-four hours the child should be nursed from every two to three hours in proportion to its appetite and the condition of the breasts. From the beginning, absolute regularity should be observed. If the child is vigorous and the mother has an abundant supply of milk, it may nurse twice from six in the evening to six in the morning. Usually once between ten in the evening and six in the morning is sufficient. It is most important that regularity should be observed in nursing. The influence upon the mother is most salutary by giving her undisturbed rest and by promoting a steady and adequate secretion of milk. For the child, its habits are formed from the first few days of its extrauterine existence. It is noticeable that with infants cared for with absolute regularity colic and fretfulness are uncommon, and nutrition is best secured.

Posture and Movement During the Puerperal State.—Care should be taken that a patient is not allowed to lie continuously upon the back during the puerperal period. A tendency to retroversion of the uterus is thus developed, and this displacement may become permanent. After the first few days the mother should turn upon the side frequently, and as the uterus descends into the pelvis she should turn partially upon the abdomen. If a tendency to retroversion is discovered, the mother should assume the knee-chest posture several times daily.

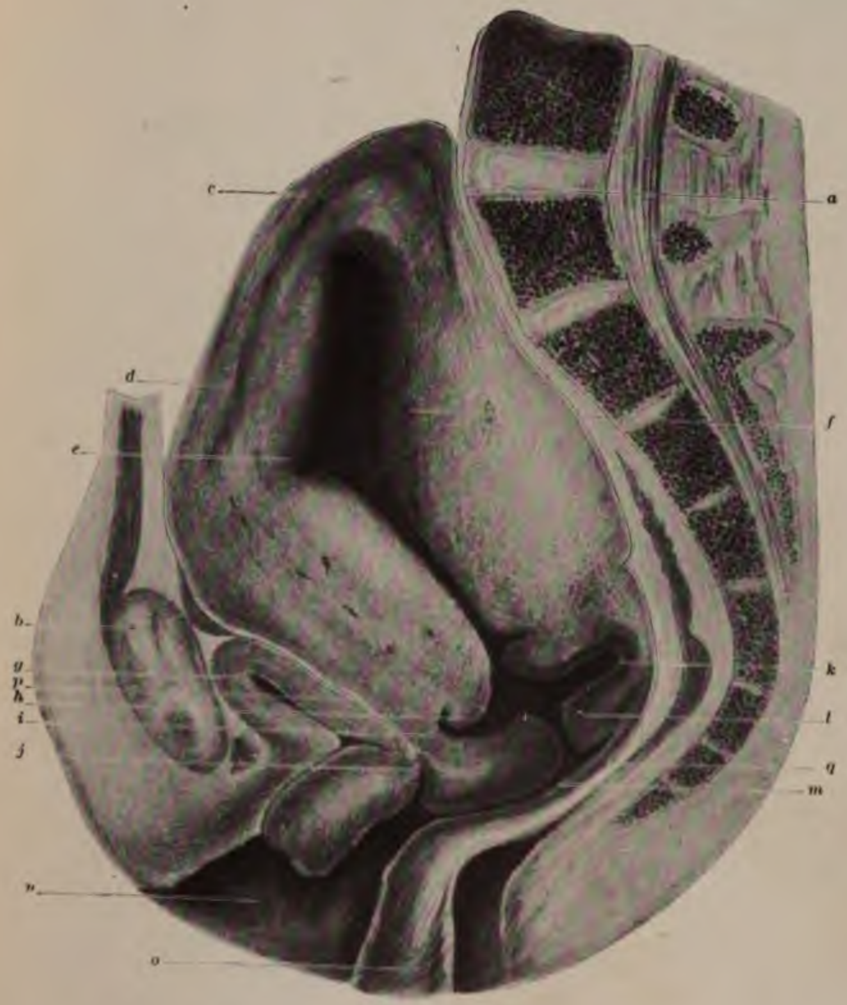
The degree of motion which a patient may be allowed must depend upon the strength and constitution of the patient, upon the degree of involution which is present, and the firmness and healthful condition of her tissues. It is a great mistake to allow the patient to take increased exercise because a given time in the puerperal period has arrived. Her condition alone justifies an important change. When the uterus has reached the pelvic brim, the patient may sit up in bed for her meals, and may usually leave her bed to use a commode to obtain a movement of the bowels. She may also lie upon a couch recumbent. When the fundus of the uterus is completely behind the symphysis and the uterus is entirely a pelvic organ, the patient may use the commode for all necessary purposes and may walk about her room. Should the lochial discharge reappear and be bright red in color, the patient must take less exercise and remain recumbent until the flow has ceased. When the genital tract has undergone good involution, the uterus being in good position and the patient's strength being good, she may go up and down one flight of easy stairs, having assistance to go up the stairs. A strong person should stand behind her, and, placing both hands upon the posterior surface of the sacrum at the junction with the ilium, should lift the patient upward as she takes each step. When the patient can go down stairs, she can take fresh air in good weather by driving or walking upon a piazza. When the lochial discharge has entirely ceased and involution is complete and the patient's general condition is good, she may walk upon the street.

Progress of Convalescence.—We are accustomed to estimate the progress of puerperal convalescence by observing the involution of the uterus. Immediately after labor the fundus is at the umbilicus. In ten days or two weeks after labor it is half way between the umbilicus and the pubes. In from three to four weeks after labor the fundus is at the brim of the pelvis, and in five or six weeks after confinement the uterus is entirely a pelvic organ. The progress of uterine involution is estimated by abdominal palpation. (Plates XXIV, XXV, XXVI.)

Importance of Fresh Air in the Lying-in Period.—The old prejudice against catching cold has retarded the convalescence of many puerperal women. While such a patient should not be exposed to a direct draught of cold air, her room should be abundantly ventilated. In cold weather an open fire is best, and ventilators may be placed beneath the lower sash of one window to furnish a constant supply of fresh air. In warm weather the windows should be freely opened and protected from the heat by awnings or blinds. The infant should, from the first, be kept in well-ventilated rooms, and in cases where convalescence seems tardy great improvement is often obtained by taking the mother out of a city into the fresh air of the country or the shore, even before she is able to be much upon her feet. This is especially true in puerperal convalescence occurring during the intense heat of summer.

Use of Drugs in the Puerperal Period.—Those drugs which stimulate a nervous system deficient in energy, and which cause the uterine muscle to contract, undoubtedly promote involution. Strychnia and ergot in tonic doses accomplish this. It is found that if the uterus be kept well contracted, after-pains are almost never seen, as they result from the formation of a clot within the womb. Bitter tonics, as nux vomica and gentian, are useful during the puerperal period to correct a sluggish condition of the intestine. In anæmic women iron and arsenic are advantageous. It is necessary in almost all cases to use mild laxatives constantly until the patient can assume the upright position. It is, however, a great mistake to give drugs freely to puerperal women for slight pains or for restlessness or nervousness. If they are cared for properly and with regularity, they do not require them, and nutrition is much better without them.

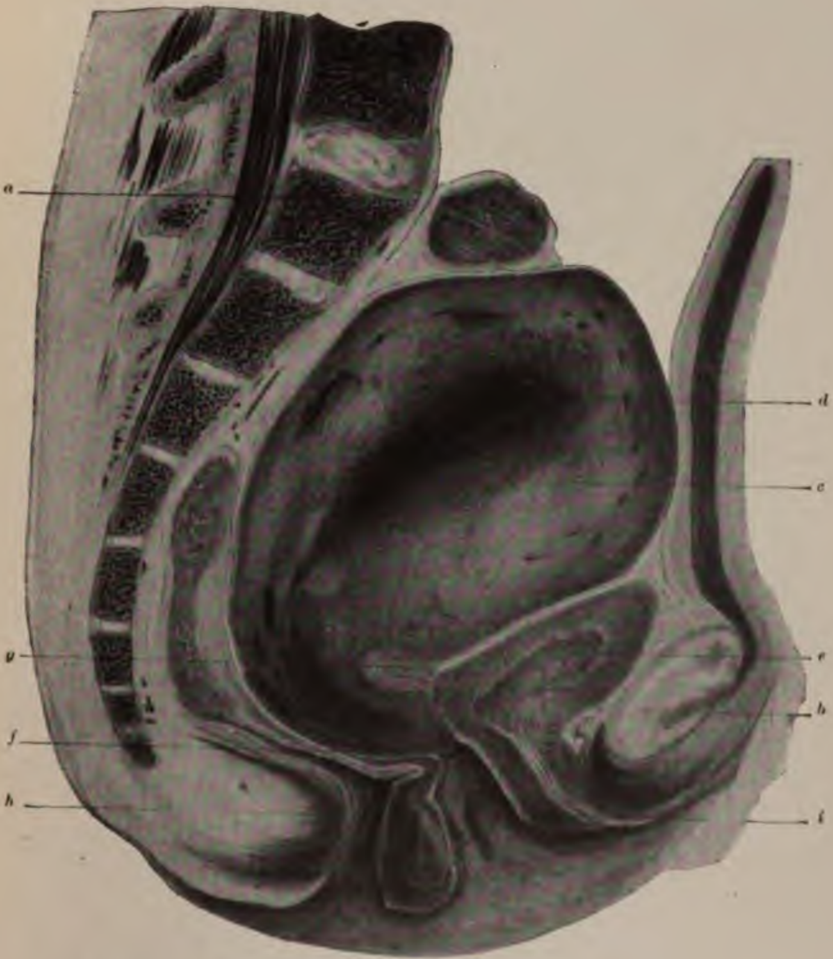
PLATE XXIV.



Uterus, five minutes after delivery. Vertical Section. (WEBSTER.)

a. **Promontory.**
b. **Symphysis pubis.**
c. **Fundus uteri.**
d. **Closed sinus in uterine wall.**
e. **Uterine cavity containing blood-clot.**
f. **Placental site.**
g. **Bladder.**
h. **Retraction-ring.**
i. **Lower uterine segment.**
j. **Anterior fornix.**
k. **Cavity of uterus above cervix.**
l. **Cervix.**
m. **Upper part of vagina.**
n. **Lower part of vagina.**
o. **Perineum.**
p. **Utero-vesical pouch.**
q. **Pouch of Douglas.**

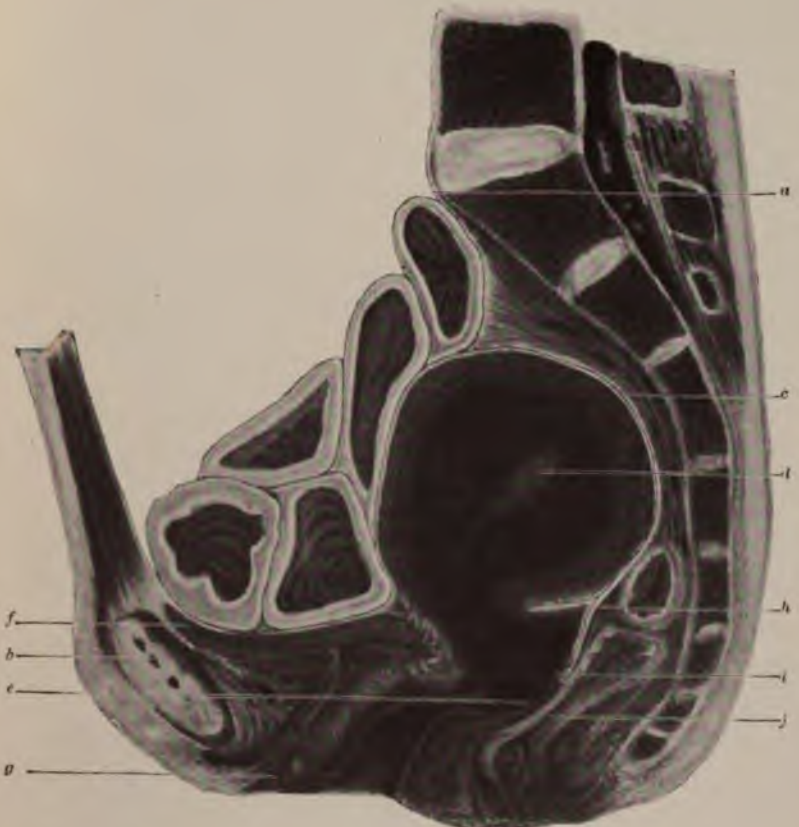
PLATE XXV.



Third Day of Puerperium. Vertical Mesial Section. (WEBSTER.)

- *a.* Promontory.
- *b.* Symphysis pubis.
- *c.* Uterus.
- *d.* Cavity of uterus.
- *e.* Bladder.
- *f.* Os externum.
- *g.* Utero-vesical pouch.
- *h.* Rectum.
- *i.* Vagina.

PLATE XXVI.



Fifteenth Day of Puerperium. Vertical Mesial Section. (Webster.)

a. Promontory.
b Symphysis pubis.
c. Fundus uteri.
d. Cavity of Uterus.
e. Os externum.
f. Bladder
g. Urethral orifice.
h. Bit of right utero-sacral ligament.
i. Posterior fornix.
j. Rectum.

SECTION II.

THE PATHOLOGY OF THE PUERPERAL STATE.

CHAPTER IV.

POST-PARTUM HEMORRHAGE.

HEMORRHAGE after labor is called post-partum hemorrhage. It may also be termed secondary hemorrhage in distinction from bleeding which occurs at labor. The primary cause of post-partum bleeding is relaxation of the uterus, which leaves the sinuses in the uterine wall open and permits bleeding to take place. Occasionally such hemorrhage occurs from a diseased condition of the womb, and more rarely the uterus, which has been well contracted, may relax after labor and bleeding result.

Post-partum hemorrhage may also be divided into primary and secondary. By the first we mean hemorrhage which immediately follows labor and which accompanies relaxation of the uterus, which often occurs to a slight extent within the first hour following delivery. Cases are occasionally seen in which hemorrhage occurs at irregular intervals during the first week or ten days following the birth of the child. This might be termed secondary post-partum hemorrhage.

Predisposing Causes.—A highly excitable nervous system, with deficient nutrition, deficient development of the uterus, a depraved condition of the blood, resulting from chronic anæmia or pre-existing infection; great mental depression and exhaustion through long-continued labor, all predispose to post-partum hemorrhage. Arteriosclerosis in the vessels of the lining membrane of the uterus, often seen in nephritic patients, greatly increases the danger of post-partum hemorrhage. Extremes of heat or cold, which profoundly depress the vital functions of the patient, also predispose to hemorrhage.

Exciting Causes.—The most frequent immediate cause of post-partum hemorrhage is relaxation of the uterus. This leaves the sinuses in the uterine wall to which the placenta was attached without the muscular ligatures which the contracted fibres of the uterus supply. Thrombi which may have formed are dislodged, and blood may pour rapidly from the womb. The exciting cause of hemorrhage from the cervix is laceration opening a vessel. Rapid delivery in a patient in good condition is not an exciting cause for hemorrhage, as seen in delivery by Cæsarean section.

Signs and Symptoms.—The symptoms of post-partum hemorrhage are a rapid, feeble pulse, considerably above 100; a pale, anxious countenance, hurried breathing, cold skin, sensation of darkness of vision and a lack of air, with restlessness on the part of the patient. If the abdomen be examined, the uterus will be found large and flabby, or may be so distended that it cannot be outlined. Usually a copious flow of blood occurs from the vagina, but severe hemorrhage may take place and the blood be retained within the uterus by a large clot within the cervix.

A free flow of blood and the passage of large clots indicate bleeding from the sinuses from the body of the womb. A constant, small stream of bright blood, persisting while the uterus remains well contracted, indicates hemorrhage from a torn vessel in the cervix. In hemorrhage from the fundus the quantity of blood lost is sufficient to rapidly produce constitutional symptoms. In hemorrhage from the cervix the quantity of blood lost is comparatively small, and hemorrhage may persist for some time before the general condition of the patient draws attention to the fact that she is losing blood.

Natural Course.—In cases which receive no treatment, if the condition of the blood favors its coagulation, a clot forms within the uterus; in rare cases the discharge of blood is so profuse and sudden that there is not time for a clot to form, but the patient is brought into syncope, or even death, immediately following the hemorrhage. In some cases the formation of a large intrauterine clot results in the gradual cessation of bleeding. The patient faints from exhaustion, and this slows the action of the heart and reduces the rapidity and vigor of the blood current. Hemorrhage finally ceases, the clot gradually breaks down, and there is a constant discharge of dark, grumous material. As a clot furnishes excellent culture grounds for bacteria, infection is likely to occur, and symptoms of puerperal sepsis are added to those of exhaustion from hemorrhage. In other cases the presence of the clot not only does not stop bleeding, but, by preventing uterine contraction, maintains a constant bleeding until the womb contracts to expel the clot, or the clot breaks down and a sudden and alarming gush of blood is followed by rapid syncope and death. In hemorrhage from a torn cervix the bleeding ceases spontaneously, but in an indefinite time and after the patient has become much reduced.

In cases of moderate hemorrhage the patient is not greatly weakened, a clot of moderate size forms within the womb, bleeding ceases, and within a few days the patient expels the clot firmly organized and with but little additional hemorrhage. In unfavorable cases death occurs with the phenomena of acute cerebral anæmia, great restlessness, air-hunger, and profound shock being present.

Prophylaxis.—The prevention of post-partum hemorrhage is most important, because such hemorrhage opens wide the door for infection, retards recovery, and may result in long-continued ill-health for the patient. Death from this cause is not infrequent, as it is usually accompanied by infection or by some other complication of labor. It is seldom given as a cause of death. The prevention of post-partum hemorrhage requires the avoidance of those conditions which tend to greatly depress and weaken the parturient patient. Such a patient must not be allowed to struggle hopelessly in impossible labor where a contracted pelvis or abnormal presentation makes spontaneous labor impossible. During pregnancy, care should be taken to maintain the patient's nutrition and to correct anæmia. The occurrence of an infection like typhoid or malaria must put the physician upon his guard at the time of labor. Nephritic patients must receive appropriate treatment, and this condition must be kept in mind in conducting labor.

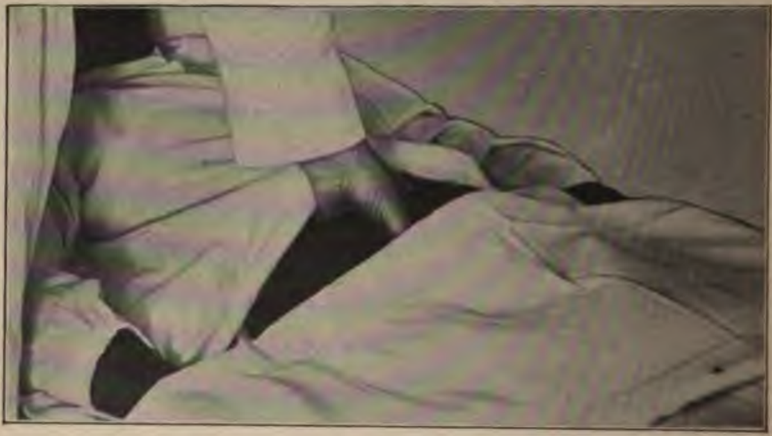
When parturition occurs, precautions must be taken to avoid exhaustion during the act of labor itself. In a prolonged first stage the patient must obtain sleep and small quantities of nutritious food must be taken at frequent intervals. During the stage of expulsion, the uterine muscle should be watched to observe any tendency to relaxation or weakness. At the moment when the child is expelled the uterus should be followed down through the abdominal cavity by the physician's hand and sufficient pressure be maintained to insure its firm contraction. There is no objection to administering ergot or strychnia, or both, from five to ten minutes before the placenta is expelled. In the experience of the writer, this does not result in retaining the placenta, but favors its expulsion. A small quantity of ether or chloroform given at the height of a pain during the second stage does not, in the writer's observation, increase the tendency to hemorrhage. Large quantities of ether or chloroform, producing relaxation of the uterus, favor the occurrence of bleeding.

A most important prophylaxis in post-partum hemorrhage is the proper delivery of the placenta. No greater mistake can be made than to attempt to expel the placenta by Credé's method before the uterus is ready to deliver it. Unless hemorrhage occurs, from twenty minutes to half an hour should elapse before the physician attempts to secure the expulsion of the placenta. The uterus should then be grasped in its median line upon the anterior and posterior walls of the fundus, should be firmly compressed from before backward, and pressure should be made downward and backward in the axis of the pelvis. At the same time the patient is asked to close the mouth and to strain and bear down. To attempt to deliver the placenta prematurely results in its partial separation, in hemorrhage, and in relaxation of the uterus. The attempt to deliver the placenta by pulling upon the cord results also in partial separation, relaxation, and bleeding.

Anæsthesia should not be carried to a profound extent, unless in cases of tetanus of the uterus with threatened rupture. If the forceps is used, delivery must be gradual and traction made during the pains. If version and extraction are done, the uterus should be followed down as the body of the child emerges. But most important of all is the physician's duty to know personally by palpation that the uterus is well contracted after labor, and that it remains so. Symptoms of shock and excessive fatigue must be carefully sought, and their presence will oblige the physician to remain with his patient until recovery takes place.

Treatment.—The active treatment of post-partum bleeding consists, first of all, in causing the womb to contract by manual pressure. The abdominal binder must be at once removed and the hands carried deeply into the abdomen above the uterus. The womb should then be kneaded vigorously between the hands, and as it grows smaller it should be grasped between the fingers, carried well down behind the fundus, and the thumb placed upon its anterior surface. The womb should be anteflexed, the fundus being carried downward and forward toward the pubic joint. Next in importance is the prompt removal from the womb of clots which prevent its firm contraction. The aseptic hand should be introduced into the vagina and clots promptly removed from the uterus. This should be followed by copious douching with hot sterile water at a temperature of 110° to 120° F. A glass tube long enough to reach well within the uterus should be sterilized and ready at each labor. It may rarely be needed, but it should be available. So soon as possible a hypodermatic syringeful of ergot, prepared for hypodermatic use, should be injected deeply into the thigh or into the abdominal wall.

FIG. 145.



Correct and efficient method of grasping uterus to prevent bleeding.

The majority of cases of post-partum bleeding are stopped by these measures because uterine contraction is secured. There remains, however, the patient's weak and exhausted condition, without which bleeding could not occur, and which results from the hemorrhage. To combat this successfully stimulants must be addressed to the nervous system, while easily digested food and diffusible stimulants must be promptly given. The best stimulant in these cases is strychnine, which may be given by hypodermatic injections in doses of one-twentieth grain until a third or one-half grain has been taken. In cases where respiration seems to flag, atropine may also be injected in one or two doses of $\frac{1}{100}$ of a grain each. When the heart seems especially to fail, several syringefuls of ether may be injected with advantage, and digitalis is indicated. Although alcohol is valuable, it is of less importance than the stimulants which have been named. In patients with whom the cerebral centres seem to be in a condition of exhaustion, morphine may be given by hypodermatic injection with positive advantage.

In using ergot to check post-partum hemorrhage it must be remembered that the action of the drug is addressed to the uterine muscle, and that the uterus may occasionally be firmly contracted and still hemorrhage be present. The value of ergot, then, is limited in these cases, and, while it may be administered to advantage, it is of secondary importance to strychnia and to compression of the uterus and the hot douche. Two or three syringefuls of aseptic ergot, prepared for hypodermatic use, may be employed to advantage in these cases.

The patient's blood loss must be made good as rapidly as possible by transfusion. Experience has shown that a direct transfusion of blood is not often performed successfully, while it has no particular advantage over the free use of normal saline solution.

While in maternities and operating rooms it is desirable to be exact in the strength of the solution employed, in emergencies at private houses it is quite sufficient to add a teaspoonful of table salt to a pint of water which has been boiled, and so to use it.

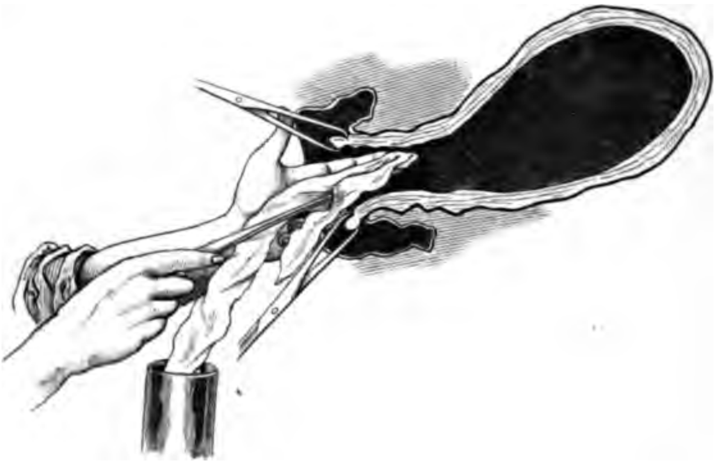
The fluid may be introduced into a vein if the operator has the necessary appliances for such a procedure, or a needle may be thrust into the connective tissue in the space between the large muscles upon the outer side of the thighs, at the sides of the chest, just above the clavicle, or any convenient region of the body. All that is needed is a clean fountain syringe and transfusion needle and the salt water to form the fluid. As to the amount of fluid which may be injected to advantage, this is limited only by the patient's power to absorb it. Several pints may be taken with positive gain.

Those general procedures which are employed in cases of surgical hemorrhage are required for these patients. The head should be low and a hot bottle, properly covered, placed beneath the base of the brain. Dry heat should be freely applied about the whole body. The patient may be partially inverted, but not in the absurd fashion so often practised, in which the foot of the bed is raised upon a few books, or possibly one or two bricks. Unless the foot of the bed is raised from 3 to 5 feet from the floor, the procedure is useless. The limbs may be tightly bandaged from the extremities upward to assist in retaining blood in the trunk of the body. Inhalations of oxygen and the use of electricity, one pole at the base of the brain or upon the dorsal region of the spine and the other over the womb, have been found of value. Food and stimulants may be well given by rectal injections in the shape of brandy and beef juice, whiskey, and milk, while suppositories containing musk have been found of service in some cases.

The physician must remain with his patient until he is personally assured that the uterus is well contracted, the hemorrhage entirely checked, and the patient in full reaction from shock.

Tamponing the Uterus.—In cases where the uterus is fairly well contracted, but shows a tendency to relax, or where the uterus is firm, but oozing is present, there can be no question of the value of the intrauterine tampon of antiseptic gauze. No case of labor should be attended without gauze being in readiness for such use. The strip should not be more than four inches wide and a yard long. The best time for its application is immediately following thorough emptying of the uterus by the fingers and copious douching with hot water.

Fig. 146.

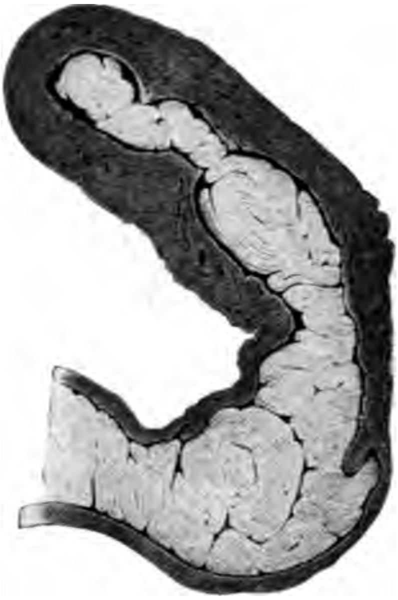


Tamponing the puerperal uterus for bleeding. (Dührssen.)

The patient is then placed upon the back or side, the package of gauze opened, uterine dressing forceps sterilized, and the fingers of the left hand made aseptic and introduced beneath the cervix. If assistants are available, tenaculum forceps and Sim's speculum may be sterilized, the pelvic floor drawn downward and backward, each lip of the cervix grasped by a tenaculum and drawn downward. The gauze can then be introduced, aided by vision. In cases where but one nurse is present and haste is imperative, the operator may use his fingers as a speculum and have the uterus brought within reach by pressure upon the fundus made by the nurse. The end of the gauze is carried along the fingers and into the uterus, and is inserted to the fundus. The uterus must not be distended with the gauze, for this would hinder contraction and favor the occurrence of bleeding. The presence of a single strip is often sufficient to excite uterine contraction. The vagina should be moderately tamponed with dry bichloride gauze. There can be no question of the value of this procedure when the gauze is properly and promptly applied. It should not be disturbed for forty-eight hours, an antiseptic dressing being worn over the vulva and the uterus being irrigated after its removal.

COMPRESSION OF BLOODVESSELS.—Post-partum bleeding may sometimes be checked by direct compression of the uterine and ovarian arteries or of the abdominal aorta. To effect the former the fingers of one hand should be introduced within the vagina behind the cervix, and the cervix carried strongly upward and forward beneath the pubic joint. The other hand should grasp the fundus through the abdominal wall, bending the womb strongly forward over the pubes. In this way the arteries are compressed as they enter the uterus. This is best accomplished by carrying the womb well down within the pelvic cavity at the same time.

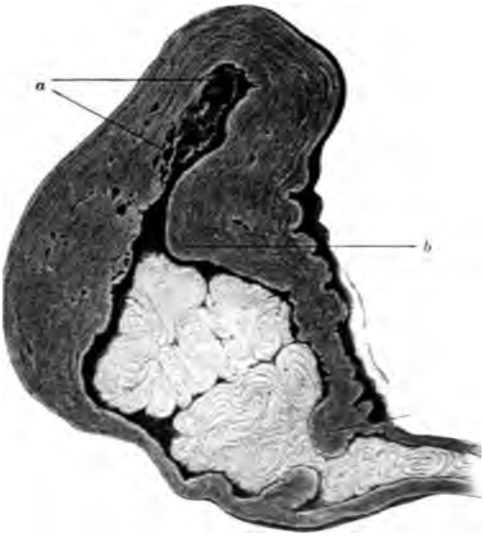
FIG. 117.



Uterus and vagina properly tamponed for hemorrhage. (BUMM.)

The abdominal aorta may be compressed against the vertebræ, and the flow of blood to the uterus gradually lessened or cut off. Cases are sometimes seen in which the uterus is firmly contracted, but in which a persistent oozing of blood continues after delivery. In these cases the loss of blood is occasioned by a diseased condition of the small vessels of the endometrium. Compressing the uterus will not control such bleeding, and it can be effectually stopped only by direct pressure upon the vessels. This calls for the application of the hot douche, followed by packing with gauze. A good result is often obtained if the uterus is scraped with the blunt curette when the douche is given. In this way diseased endometrium is broken down and removed, and the pressure exerted by the gauze has a much more direct and positive effect. Such hemorrhage may persist for a day or two after delivery, or may come on several hours after labor, when the circulation has recovered somewhat its equilibrium. Applications of astringents are sometimes used in these cases. The best of these are alum, a tablespoonful to a quart of hot water, or gallic and tannic acids, to be used by adding to one quart of hot water a tablespoonful of the glycerite of gallic acid and of the glycerite of tannic acid. The use of iron should be especially avoided in these cases, as it distinctly favors thrombosis and necrosis of the tissues. Carbolic acid may be useful in 5 per cent. solution, to be followed by a douche of simple hot water.

FIG. 148.



Uterus badly tamponed for hemorrhage. a. Clot above gauze. b. Gauze not carried far enough (BUMM.)

THE PROPHYLAXIS OF POST-PARTUM HEMORRHAGE IN OPERATIVE CASES.—In cases delivered by obstetric operations where exhaustion threatens and the mother has been in a highly nervous [illegible]on, it may be wiser to anticipate the danger of hemorrh[illegible] is under ether. She may be allowed to re[illegible] anaesthetic, and uterine contractions se[illegible] placenta. After this has been deliv[illegible] kept under control by the anaestheti[illegible] been introduced within the [illegible] irrigated with hot lysol.

iodoform gauze. Lacerations in the cervix requiring suture may then be closed, and injuries to the pelvic floor and perineum should be immediately repaired. The vagina should be moderately tamponed with dry bichloride gauze. The patient may be given strychnia and ergot hypodermatically, and, upon recovering from anæsthesia, relaxation of the womb, hemorrhage, and shock will be very much less frequent than in cases in which such precautions are not taken. While we thoroughly believe that the interior of the uterus should not be molested if such interference can be avoided, experience has shown us that in the cases described this method of treatment is safe and efficient. The gauze may be allowed to remain thirty-six or forty-eight hours, and then removed and one thorough irrigation of the uterus and vagina with 1 per cent. lysol should be given. No further douches are required. We have not seen infection follow this method, nor have we observed complications attending its use. It is impossible for a clot of any size to form within the uterus if tamponed with gauze, and relaxation and hemorrhage do not occur under these conditions. In the hands of a physician not accustomed to practise antiseptic precautions, this method should not be employed. Those who rely upon cleanliness only, and who are not accustomed to sterilize instruments and to practise antiseptic precautions, should, under no circumstances, interfere with the puerperal uterus.

THE TREATMENT OF POST-PARTUM HEMORRHAGE FROM TEARS OF THE CERVIX.—The best treatment for post-partum hemorrhage following tears of the cervix is the immediate closure of the laceration by suture. If the patient is already anæsthetized, the procedure is a simple one. If a speculum be available, the pelvic floor should be depressed by it and the two lips of the cervix seized in the centre by one large tenaculum forceps and pressed firmly together. The cervix should then be drawn strongly downward and to one side, thus exposing the tear upon the opposite side of the cervix. Sutures of chromicized catgut should be passed by a large, fully-curved needle through the torn tissue, taking especial care that the highest stitch is placed sufficiently high to cover the beginning of the laceration. From one to three sutures suffice to close such a laceration. The cervix should then be carried to the opposite side, when the other side of the cervix and its laceration will be exposed for examination. Usually the tear is greater upon one than upon the other side of the cervix. It is not uncommon for a tear requiring three sutures to occur upon the left side of the cervix while the right remains practically uninjured. This method immediately stops hemorrhage, and in most cases lacerated tissues unite and good union is obtained. No after-treatment is required except the external antisepsis needed in all cases. The knots of catgut remain unabsorbed, and appear in two or three weeks after labor in the vaginal discharge. In the absence of assistants, a speculum is unnecessary, and the skillful operator can proceed by the sense of touch alone.

In cases where the patient is exhausted and circumstances make the use of sutures impossible, hemorrhage from the torn cervix may be stopped by tightly packing the cervix with iodoform gauze. The cavity of the uterus should also be tamponed, and the vagina should be firmly packed with bichloride gauze. A copious vulvar dressing and a firmly-applied T-bandage will continue to make efficient pressure.

Post-partum Hemorrhage from Ruptured Vessels in the Vagina and Vulva.—Ruptured veins or arteries in the vagina and vulva may occasion post-partum bleeding. In these cases the blood must be rapidly sponged away with gauze, bleeding points seized and ligated, or a mass of bleeding vessels controlled by passing a catgut ligature beneath them. Considerable hemorrhage may come from torn vessels in the anterior pelvic floor in the region of the urethra and clitoris. Ruptured veins in the vagina may also occasion bleeding after labor.

FIG. 149.

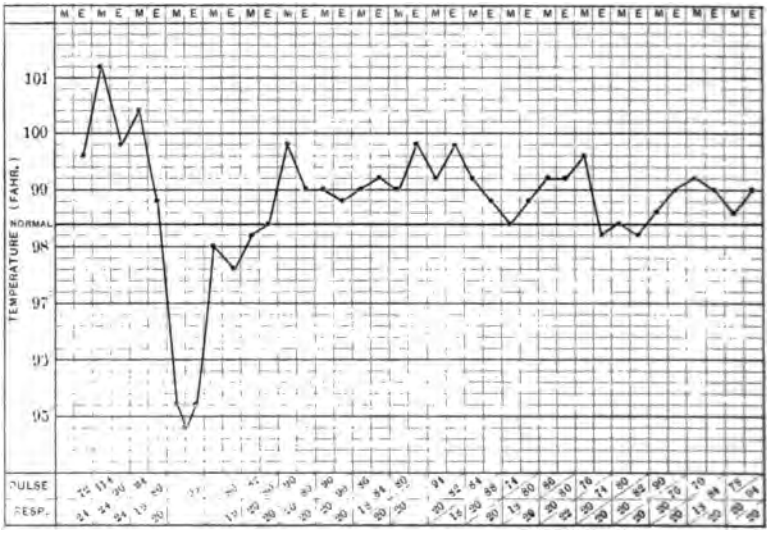


Chart.—Ill-nourished primipara, aged 17; spontaneous labor, post-partum hemorrhage about midnight, fourteen hours after labor.

If suture is impossible and the tampon is used, the precaution must be taken to thoroughly tampon the entire genital tract. Unless this is done in the case of ruptured veins, a partial tamponade will result in increasing venous hemorrhage. Firm compression by gauze and a T-bandage will permanently stop the bleeding.

Secondary Post-partum Hemorrhage.—The treatment of secondary post-partum hemorrhage is that suitable in primary cases. In the experience of the writer a patient had three attacks of post-partum bleeding within the first three days after labor, for which no cause

FIG. 150.

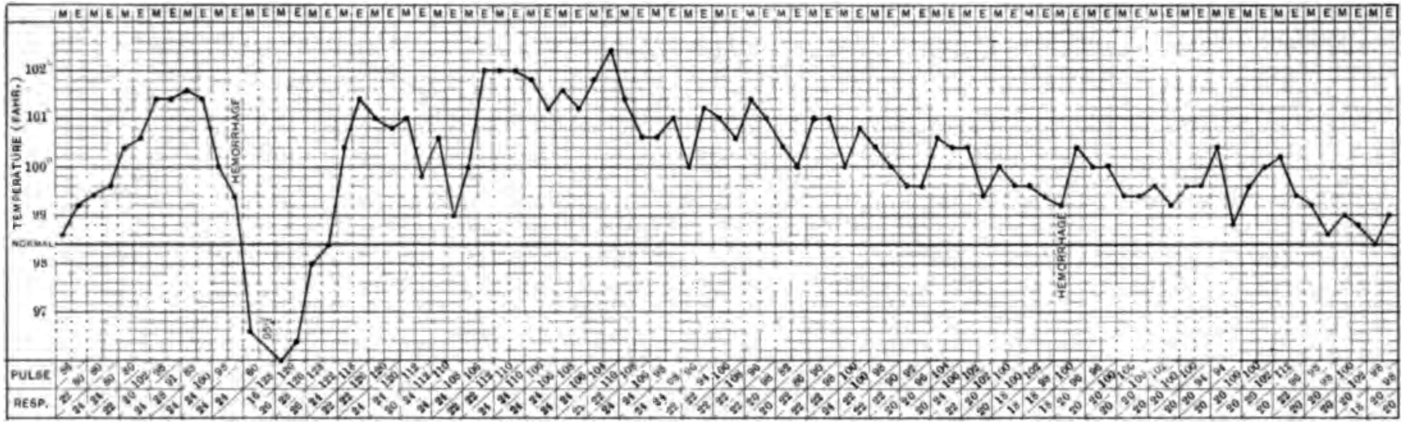


Chart.—Anæmic multipara, spontaneous labor, repeated post-partum hemorrhage controlled by intrauterine tampon of iodoform gauze. Examination of the mother's blood: (1) Hæmoglobin, 37%; red cells, 3,450,000; white cells, 6,000. (2) Hæmoglobin, 45%; red cells, 3,500,000; white cells, 2,800. An interval of nine days elapsed between the blood counts.

could be found. Each case was controlled by the methods already described. The persistent recurrence of hemorrhage after delivery points to the retention of a portion of the placenta or to the possible development of syncytioma malignum. Curetting with the blunt curette is indicated in these cases with hot irrigation and packing with antiseptic gauze.

CHAPTER V.

PUERPERAL SEPTIC INFECTION.

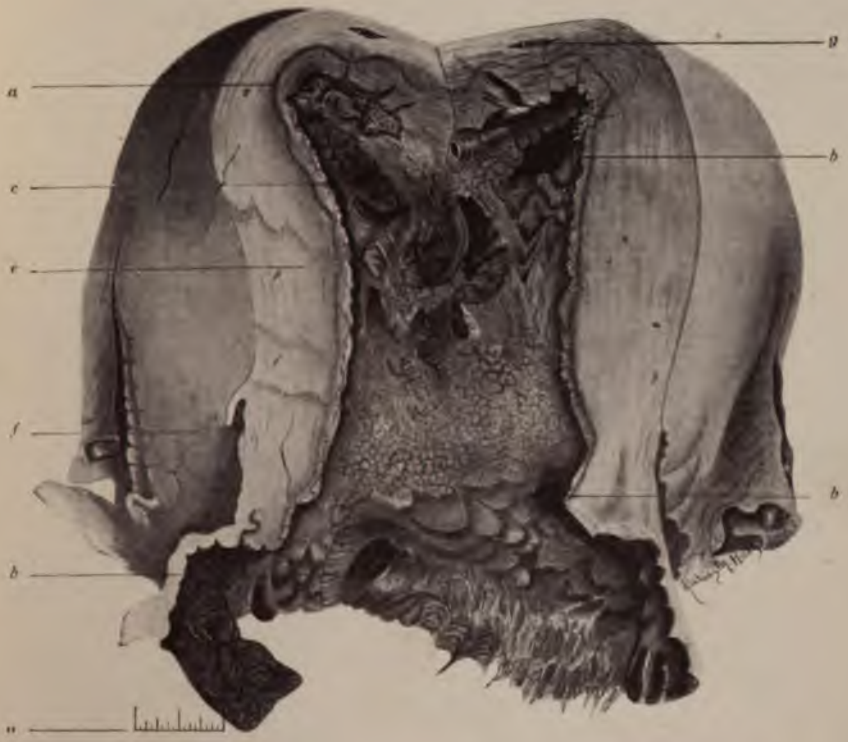
The most important complication of the puerperal state is septic infection. This is produced by poison introduced during or after labor, or from the absorption of necrosed material which results from injury during labor.

There has been much discussion as to whether puerperal septic infection can arise without external contamination. At the present time it is not believed that autoinfection, in the strict sense of the word, takes place. Practically, however, and so far as labor is concerned, autoinfection may arise from foci of infection which have been latent within the patient's body for some time before labor occurred. Gonorrhœa may produce pyosalpinx, and some time after the gonorrhœal infection the pyosalpinx may rupture during labor, causing infection of the peritoneum. A cancer which has been growing for some time before labor may cause general septic infection. Syphilis during pregnancy may result in lesions which produce general septic infection after labor. Bacteria from the intestine, originally introduced into the body through impure water or food, may penetrate the wall of the intestine after labor, causing infection of the peritoneum. All of these infections are puerperally septic in nature, but each has arisen from some contamination from without.

Symptoms.—The symptoms of this condition are those of surgical sepsis. In the milder cases infection occurs in some lesion of the vagina. Such are found in tears of the perineum and pelvic floor and also in injuries of the mucous membrane, which ordinarily escape detection. Between two and three days after labor the patient is taken with a chill, followed by fever and rapid pulse. The mucous membrane of the vagina is red and swollen, the lochia diminishes, pain is experienced in the abdomen and pelvis, while constipation is usually present. In favorable cases septic germs do not extend beyond the vagina. The symptoms subside as the vaginal inflammation grows better in a few days.

If these patients be examined, areas of granulating tissue will be

PLATE XXVII.



Puerperal Septic Infection. Uterus laid open by incision through anterior wall.

(*a*) Scale: 1 inch.

(*bbb*) Cavities formed by extensive necrosis.

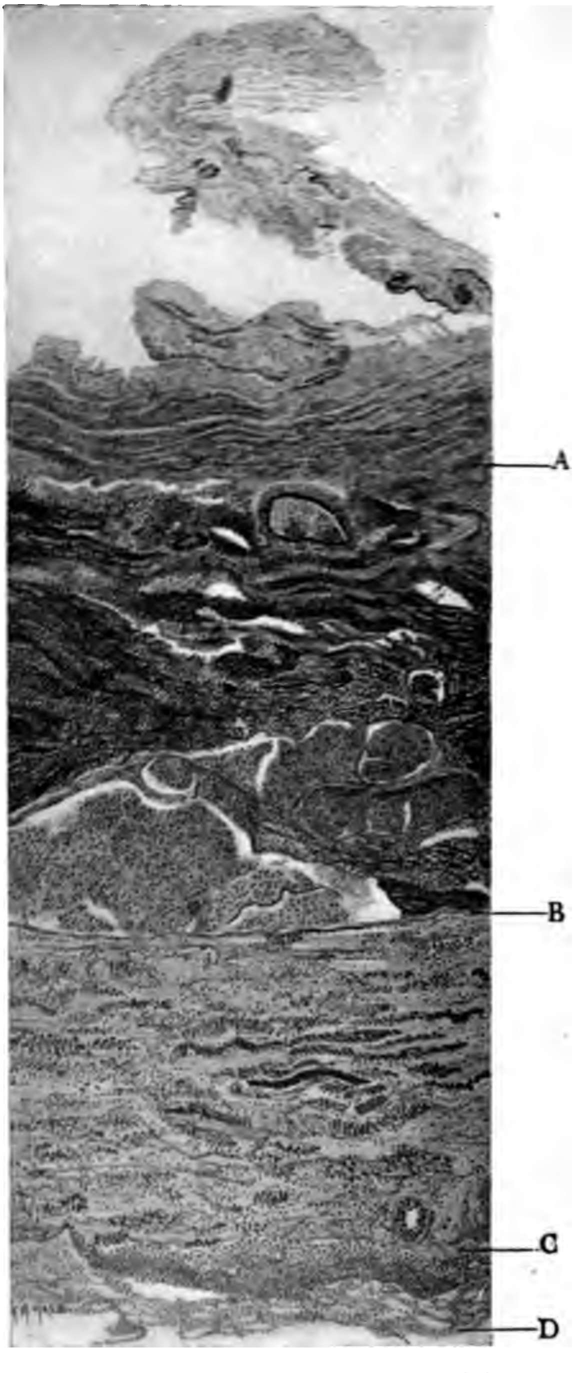
(*c*) Necrotic zone that, on its inner surface, projects as a shaggy layer, fragmenting stratum, and externally is bounded by *d*, the line of hyperemia and leukocytic accumulation.

(*e*) Muscle layer not presenting any conspicuous gross lesion.

(*f*) Peritoneal surface; early stage of serofibrinous inflammation (the block of tissue from which the microscopic drawing was prepared was taken from just above this point).

(*g*) Thrombosed sinus. (From original drawing.)

PLATE XXVIII.



Section Through Uterine Wall. Puerperal Septic Infection.

A Above this point is the necrotic layer consisting of granular detritus containing enormous numbers of bacteria (see text), fragmenting histologic elements and leukocytes.

B From A to B is the zone of hyperemia, leukocytic invasion and progressing mycotic infiltration. Numerous uterine sinuses are shown, as well as arteries, all occupied by thrombi.

C From B to C muscle showing hyalin (?) change. This part of the section is only a narrow rim of the actual muscle; nothing would have been gained by showing the entire thickness. Just above and to the left of C is an artery, the endothelium of which is proliferating.

D From C to D is shown the greatly altered serous covering. The layer represented in the drawing is largely composed of fibrin with entangled leukocytes and endothelial cells. (From original drawing.)

found in the genital canal, covered with a grayish-yellow film. This coating is composed of pus and bacteria.

In favorable cases this covering gradually disappears, and beneath a granulating tissue forms rapidly and heals firmly.

If, however, the poison extends beyond the point of entrance into the vagina, the lymphatics of the deeper tissues and cervix become involved, the cellular tissue of the pelvis is infected, while the interior of the uterus also becomes septic. The symptoms showing this extension are higher fever—103°, 104°, and 105° F.; pulse of 120 to 140; lochia containing pus, and an exudate in the pelvis around the uterus. Unless the process be promptly checked, the poison spreads rapidly to the peritoneal covering of the uterus. The Fallopian tubes may become involved, while the peritonitis does not remain localized, but spreads throughout the entire peritoneal sac.

FIG. 151.

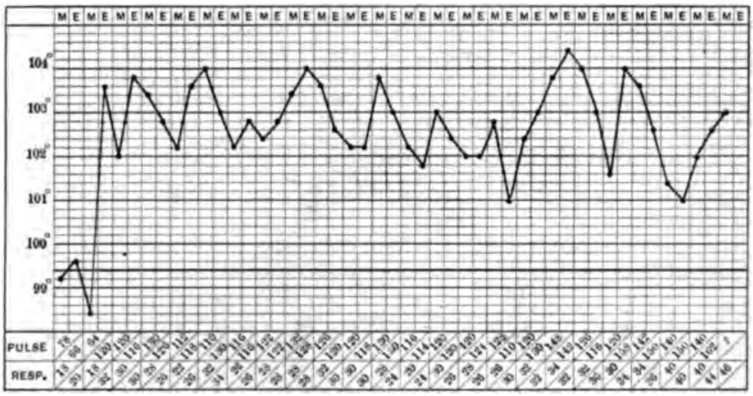


Chart.—Fatal puerperal infection with streptococci and staphylococci. Patient brought to the Jefferson Maternity during labor. Had been examined at her home by a physician who took no antiseptic precautions.

The blood may become immediately infected through contamination at the placental site or at some other portion of the uterine cavity. In these cases infected material is introduced directly into the circulation. As a result the patient will have symptoms of septic infection, while lesions may not be apparent, and while it may be difficult to determine the point at which the infection entered the blood. Such cases are often seen after criminal abortion, when the sound which the abortionist used to rupture the membranes and to break up the embryo wounded the endometrium and opened vessels in the lining of the uterus.

Cases are occasionally seen in which the violence of the septic infection affects the nervous system principally. In these patients an apathetic condition of the mind with subnormal temperature, or but slight fever or acute mania with high fever, may be present. The symptoms of puerperal septic infection may closely resemble those of other infections, as typhoid bacillus infection and that of the pneumococcus.

Course.—The thrombi which close the uterine sinuses often become infected, and septic material is carried into the circulation, causing systemic infection. Thrombosis of the veins of the liver may occur, while emboli may be carried into the spleen, the kidneys, and lungs. Thrombosis of the cranial veins and embolism of the cerebral arteries may also occur. Unless the patient be of exceptional vigor and be freely supported by food and stimulants, profound septic infection proves fatal. The patient becomes exhausted; cardiac and respiratory centres fail; delirium and coma develop; nutritious food cannot be taken, and the patient dies of exhaustion.

In favorable cases the organism resists the poison. Peritonitis may become localized and infection be limited.

FIG. 152.

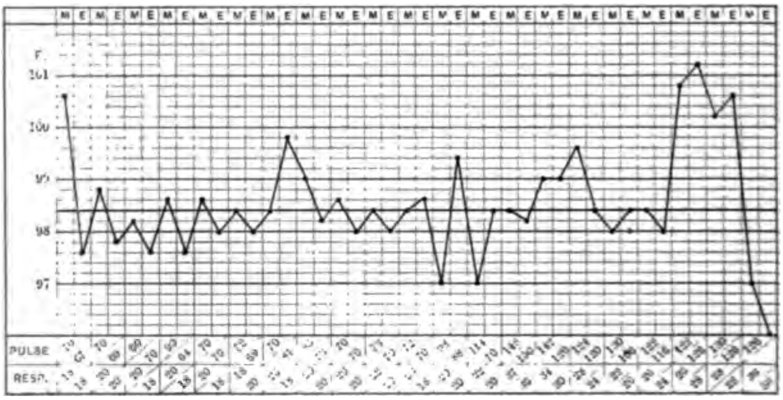


Chart —Attempted criminal abortion, stillborn child, fatal mixed infection.

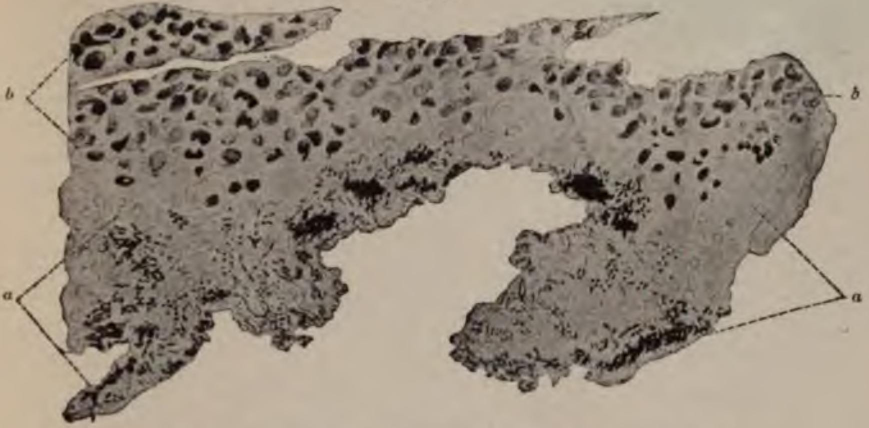
Multiple abscesses about the joints or in the connective tissue may develop, and, if drainage is secured, the septic foci may gradually heal.

Adhesions in the pelvic peritoneum bind down the pelvic organs, and exudates will mat together the intestines and abdominal peritoneum; recovery is prolonged and tedious, and the patient's general health will remain permanently impaired. Lactation will fail, and the child may become infected through the hands of the nurse or by taking infected milk from the mother. In cases which persist for some time the development of septic foci may cause errors in diagnosis, the patient dying by septic pneumonia, not recognized as caused by puerperal sepsis.

In cases in which the septic poison enters the circulation directly through the uterine sinuses, the course of the disease is more rapid. Patients develop high temperature, with profound intoxication, apathy, profuse sweating, and rapidly sink into septic coma.

PLATE XXIX.

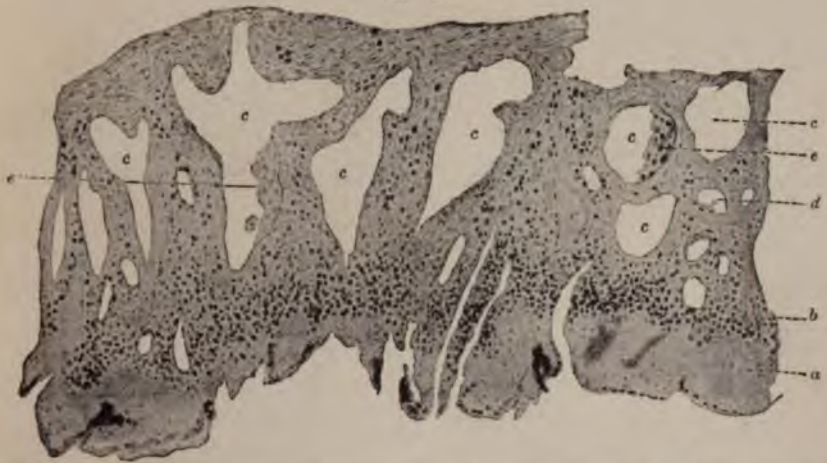
FIG. 1.



Section through Decidua from Putrid Endometritis, removed by Curette on Ninth Day. (BUMM.)

a. Necrotic tissue swarming with bacteria. b. Zone of reaction, showing nuclei of leucocytes.

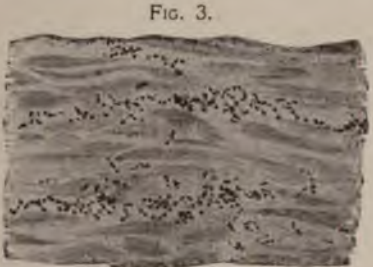
FIG 2.



Section through Decidua. Septic Endometritis, Curetting on Seventh Day. (BUMM.)

a. Necrotic tissue, bacteria in masses. b. Resisting-zone of leucocytes. c. Lumen of glands. d. Cross-section of bloodvessels. e. Remnants of epithelial cells of uterine glands.

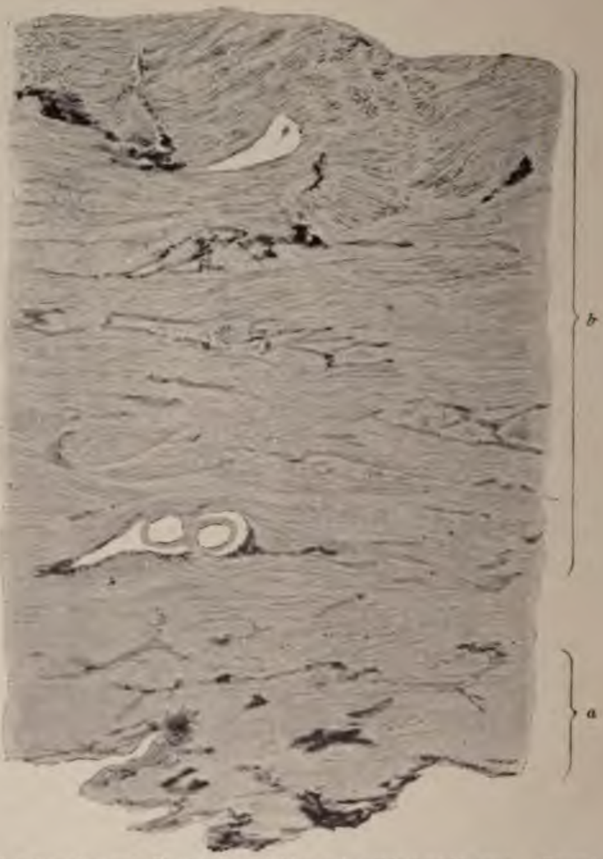
FIG. 3.



Streptococci growing between muscle fibres. (BUMM.)

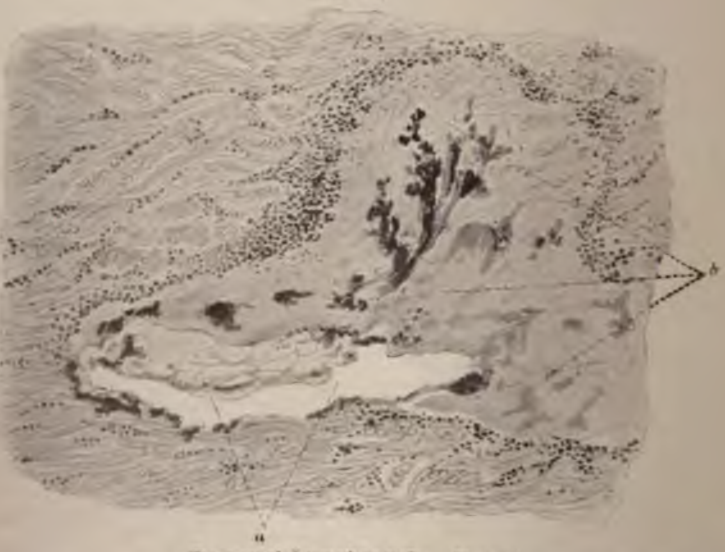
PLATE XXX.

FIG. 1.



Section through Decidua and Muscular Wall of Uterus. Fourth Day. Death from Septic Peritonitis. (BUMM.)
a. **Necrotic decidua.** *b*. **Muscular tissue.**

FIG 2.



Puerperal Lymphangitis. (BUMM.)
mphatics filled with streptococci. *b*. **Bacteria penetrating muscle-fibre which is necrotic.**

Diagnosis.—The diagnosis of puerperal septic infection can usually be made by recognizing evidence of recent parturition and the presence of symptoms pointing to constitutional septic infection. The occurrence of ulcers in the genital tract after labor points to a local condition only, and may not indicate constitutional infection. In cases where irregular lacerations of the genital tract have occurred which are not susceptible to suture, small points may develop, at which the tissues heal by granulation. There is, however, no fever in these cases if septic infection be absent. The symptoms by which a diagnosis can usually be made in puerperal septic infection are the subinvoluted condition of the uterus, which remains large and flabby, the persistence of a dark, reddish, grumous lochial discharge, ulcers in the vagina or in the cervical tissue, abdominal tenderness and distention, a rapid pulse, fever, a dry and coated tongue, constipation or diarrhœa, anorexia, apathy, or increased irritability of the nervous system. Septic mastitis is often present, and in making a diagnosis the breasts must always be examined.

Bacteriological examination of the contents of the uterus gives added light to the detection of puerperal septic infection. Under antiseptic precautions, Döderlein's tube may be inserted as near the fundus of the uterus as possible, and by suction the contents of the uterus drawn into the tube. The tube is then withdrawn and immediately sealed, and its contents examined bacteriologically. The presence of abundant streptococci or of large numbers of staphylococci, bacillus coli communis, gonococci, pneumococci, or Klebs-Löffler bacillus shows the presence of puerperal septic infection. The bacteriological examination of the blood is also valuable in these cases. In mild cases the blood may remain uninfected, and bacteria may not be found. In severe cases streptococci will be found in the blood, and in severe mixed infections other germs may also be present. It is of interest to ascertain the virulence of bacteria found in the blood in septic cases. This may be done by obtaining cultures and by injecting these cultures into animals.

The examination of the blood is also valuable in detecting the presence or absence of leukocytosis. A large increase in the number of leukocytes may indicate the formation of abscess, while a moderate leukocytosis must be taken as a favorable indication and as expressing the resistance of the organism to the septic infection. When the blood is found extensively disorganized, its hæmoglobin much dissolved, and the contour of its corpuscles greatly altered, a very severe infection may be diagnosticated. It is often difficult to obtain sufficient blood serum without depleting the patient to test the toxicity of blood serum in a septic case. If this could be done, it would also afford an excellent index of the degree of virulence in a given infection. The examination of the urine in septic cases gives some assistance in diagnosis. Casts and albumen often show that the kidneys are overburdened. If urine be carefully taken by catheter and be found swarming with bacteria, a diagnosis of cystitis complicating infection may be made. By catheterizing the ureters, evidence of infection of the kidney complicating puerperal infection may be obtained.

Physical examination of the entire body is necessary to recognize the complications of puerperal sepsis. The examination of the heart is necessary to detect septic endocarditis. Pleurisy and pneumonia may be present, the joints may be infected, and synovitis must be recognized, and the veins of the lower extremities may also become involved. Ophthalmological examination may become necessary to recognize abnormal conditions in the eyes. In some obscure and complicated cases the expert opinion of a dermatologist is required to determine the nature of anomalous cutaneous lesions. In no department of medicine is wider knowledge and better skill demanded than in the diagnosis of puerperal septic infection.

FIG. 153.

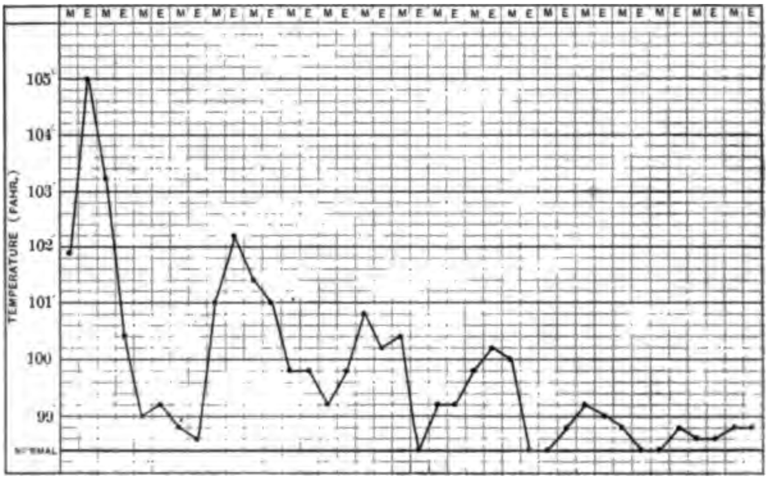


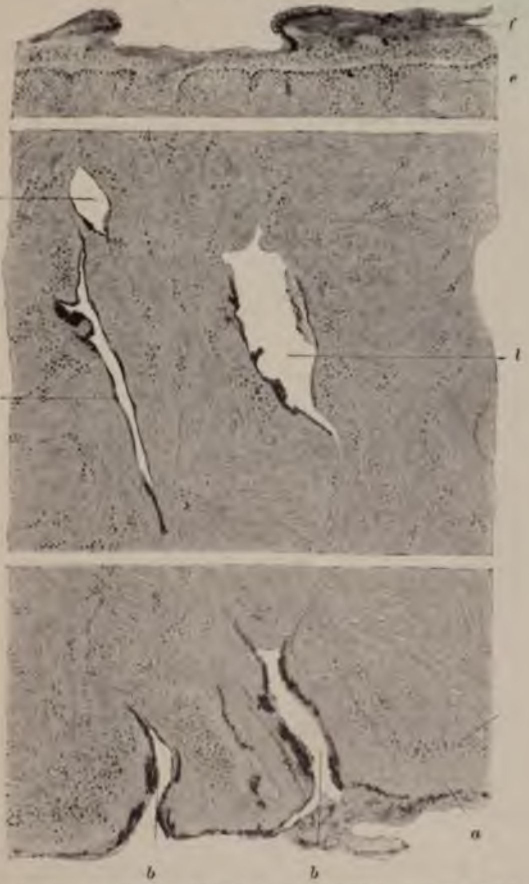
Chart.—Patient admitted to hospital during abortion; infected uterus emptied and disinfected.

Treatment.—In the treatment of puerperal septic infection two indications are paramount: First, to completely remove in the most gentle manner possible septic material retained within the uterus or genital tract, and, second, to sustain the patient's general strength and to fortify her power of resistance.

In carrying out the first indication, it must be remembered that a zone of granulation tissue protecting the bloodvessels of the uterus from the absorption of septic material is found beneath the decidual membrane. This zone of resistance should be disturbed as little as possible, and under no circumstances should be removed. The use of a sharp curette is objectionable and dangerous, because it penetrates this zone and opens lymphatics and bloodvessels to direct absorption. On the other hand, cleansing the uterus by irrigation only must be

PLATE XXXI.

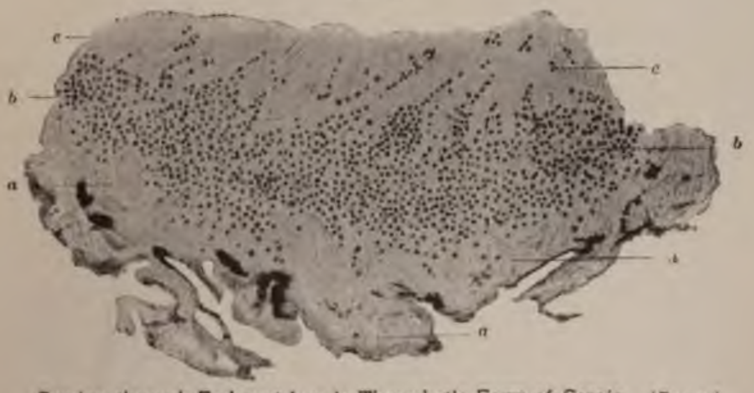
FIG. 1.



Section through Uterine Wall. Septic Lymphangitis, Twelfth Day. (BUMM.)

- *a.* **Necrotic decidua with streptococci.**
- *b.* **Lymph-spaces.**
- *c.* **Reaction-zone.**
- *d.* **Lymphatics, with streptococci.**
- *e.* **Upper layer of uterine wall.**
- *f.* **Peritoneal exudate, with streptococci on uterine wall.**

FIG 2.

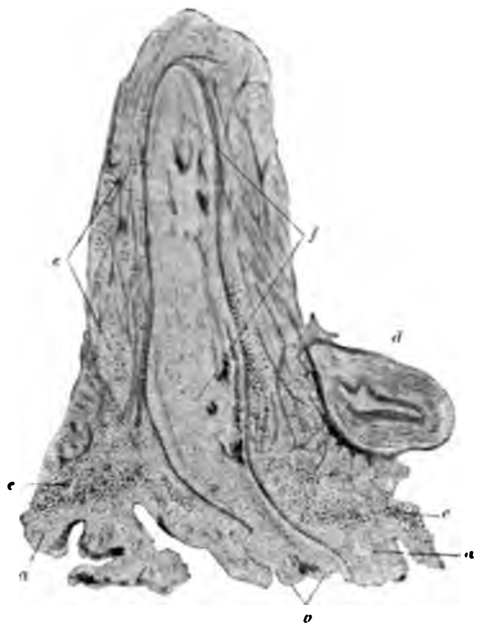


Section through Endometrium in Thrombotic Form of Sepsis. (BUMM.)

***a.* Necrotic decidua, with colonies of bacteria. *b.* Well-developed zone of reaction. *c.* Muscular tissue.**

PLATE XXXII.

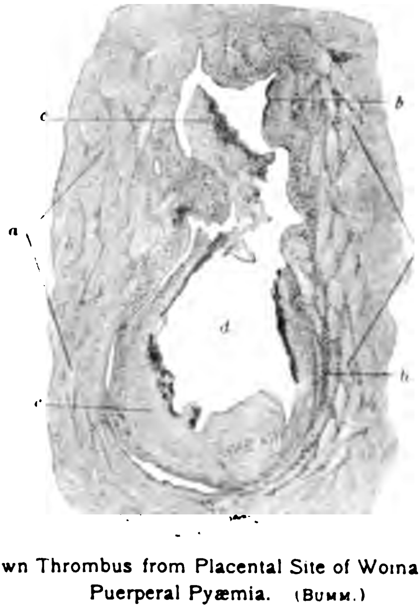
FIG. 1.



Section through Placental Site of Uterus. Death on Eighth Day after Birth from Embolic Septic Pneumonia. (BUMM.)

a. Necrotic decidua with colonies of streptococci and saprophytes.
b. Juncture of a venous thrombosis from placenta, full of bacteria, with inner wall of uterus.
c. Reaction-zone of leucocytes.
d. Section across a utero-placental artery.
e. Uterine muscle.
f. Extension of thrombus (*b*) into deep tissues.

FIG. 2.



Broken-down Thrombus from Placental Site of Woman who Died of Puerperal Pyæmia. (BUMM.)

a. Uterine muscle. **b.** Vein, its walls infiltrated with necrotic cells. **c.** Thrombi filled with streptococci.

very prolonged to accomplish what is desired. The use of the fingers covered by rubber is not efficient, because under these circumstances the finger tip glides smoothly over a portion of retained placenta or necrotic tissue without removing it. In some cases it is difficult to reach the fundus of the uterus with the fingers. Our experience has shown that a large, blunt-edged curette, with hollow stem, acts as an elongated finger, by which the uterine wall can be thoroughly but gently scraped and by which tissue which is ready to come away can be removed. Preceding the cleansing of the genital tract, if the operator desires, preparations may be made to obtain cultures from the interior of the uterus. The operator should use rubber gloves for his own protection to avoid infecting his hands. A speculum and tenaculum forceps, forceps for introducing gauze, curette, and douche bag should be sterilized in readiness. For emptying the uterus, bichloride of mercury should not be used. Cases of poisoning are sufficiently numerous to indicate clearly its danger. Normal salt solution or 1 per cent. creolin, or lysol, or trikresol, or 2 per cent. carbolic acid or boiled water only may be employed. Our own preference is for lysol, 1 per cent. If the patient is excitable, holding the abdominal muscles rigidly and complaining of pain, partial anæsthesia with ether is desirable. Deep anæsthesia should be avoided, as the uterus may relax and considerable hemorrhage may occur. Strychnia, digitalis, and ergot should be in readiness for hypodermatic use. Sterile cotton sponges in a solution of bichloride of mercury, 1 : 2,000, are required.

Fig. 151.

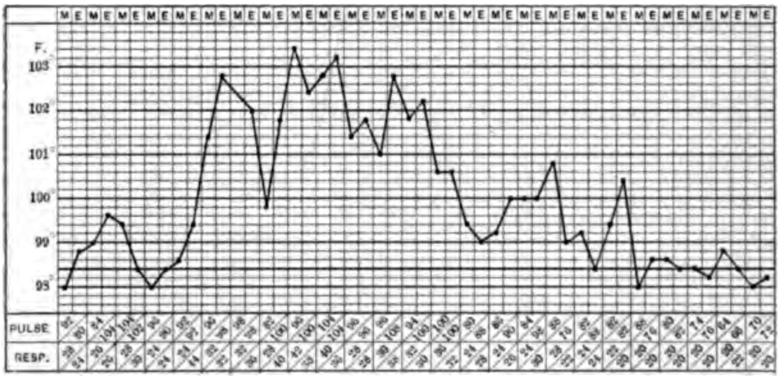


Chart.—Patient admitted to Jefferson Maternity with dead child, the breech delivered, the head remaining within the uterus; contracted pelvis, craniotomy, sapræmia, irrigation of the uterus with gauze packing, followed by recovery.

The external parts should be shaved if possible, or the hair closely clipped with curved scissors. External antisepsis should be thoroughly performed with soap and water, boiled water, and bichloride of mercury, 1 : 2,000. The bladder should be emptied by catheter.

There should also be in readiness tincture of iodine or carbolic acid, in solution 25 per cent. With the patient in the dorsal position, in a good light, the operator should inspect the perineum and vagina, and should ulcers be found, the thorough application of iodine or carbolic acid should be made to them. If lacerations have occurred and stitches are present, the stitches must be examined to determine whether union is taking place, and usually local infection will be found and the stitches must be removed. The vagina should be thoroughly mopped out with cotton sponges dipped in bichloride solution, 1 : 2,000. The tissues about the cervix and the cervix itself should be cleansed in the same manner. The vagina should then be irrigated with lysol, 1 per cent., and the curette gently carried into the uterus. The operator should depress the fundus with one hand while curetting so that he can feel the curette as it impinges against the uterine wall. The cavity of the uterus should be very thoroughly, but very gently, explored while continuous irrigation goes on. Not less than one gallon of fluid, at a temperature of 110° F., is needed. No effort should be made to remove tissue which does not come away by very gentle scraping and irrigation. If oozing follows irrigation, the uterus should be moderately tamponed with gauze containing iodoform, 10 per cent. A moderate tampon of bichloride gauze may be placed within the vagina. We cannot too strongly emphasize the fact that curetting the puerperal uterus is a procedure requiring skill and patience, and that if improperly done it may end in fatal infection. Irrigation is the main factor of this procedure, and the curette is used only to dislodge such tissue as is easily separated by necrosis from the wall of the uterus. Under no circumstances should a sharp-edged curette be employed. A small, sharp curette has been repeatedly thrust through the wall of the puerperal uterus, usually at the posterior portion of the fundus, resulting in fatal infection of the peritoneal

FIG. 155.

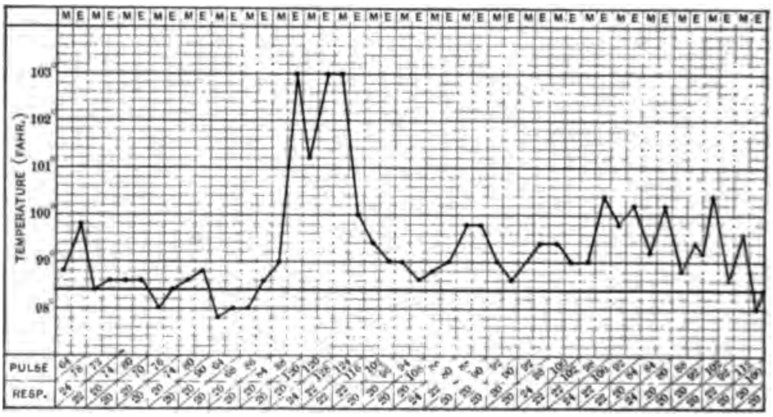
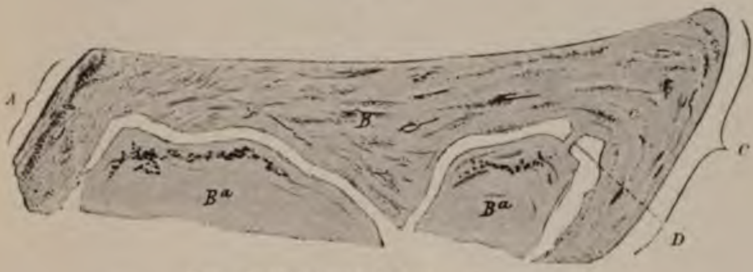


Chart.—Spontaneous labor, infection, curetting, recovery.

PLATE XXXIII.

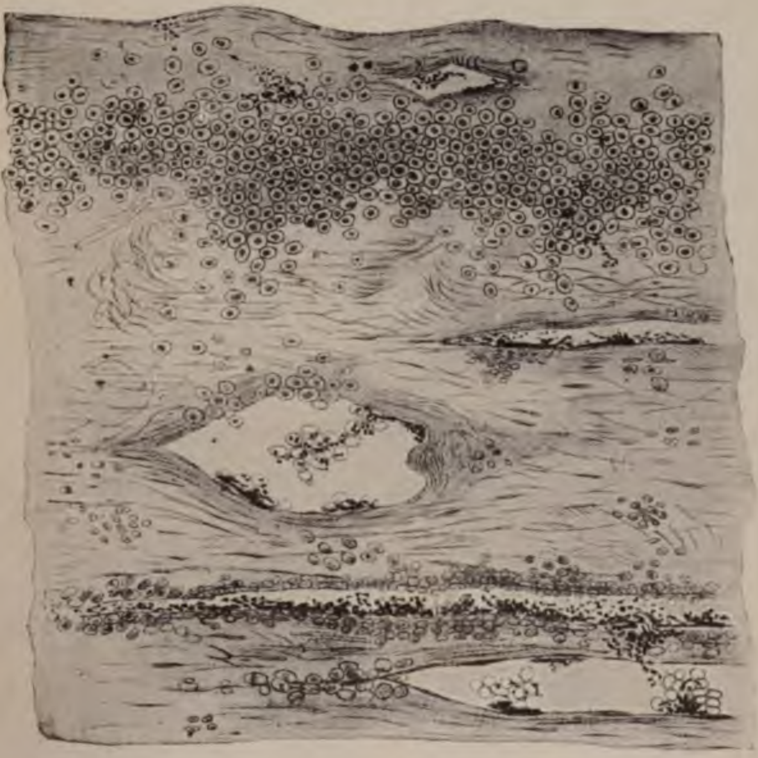
FIG. 1.



Pyæmia in Fibroid Uterus. (GAERTNER.)

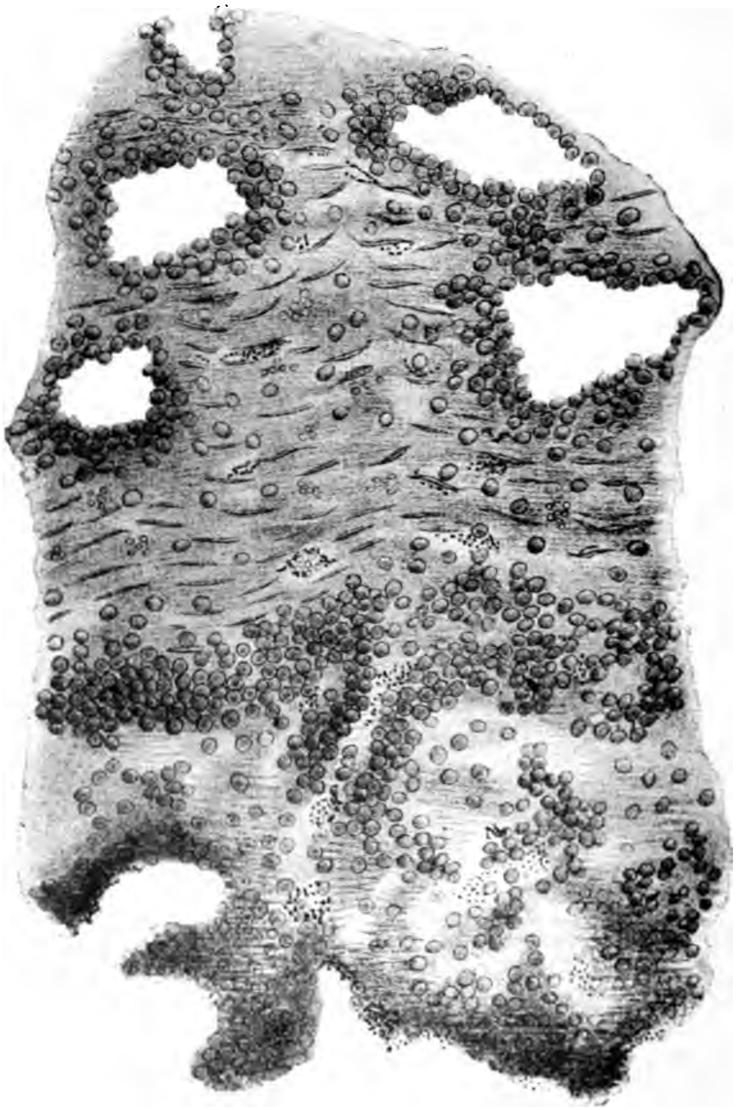
A. Endometrium.
B. Fibro-myoma.
C. Serous covering of uterus.
Ba. Necrotic masses with bacteria.
D. Connective tissue.

FIG. 2.



The same, showing Veins and Lymphatics crowded with Bacteria.

PLATE XXXIV.



Diphtheritic Sepsis, showing Tissue crowded with Bacteria, and Cells forming Diphtheritic Exudate. (GAERTNER.)

FIG. 156.

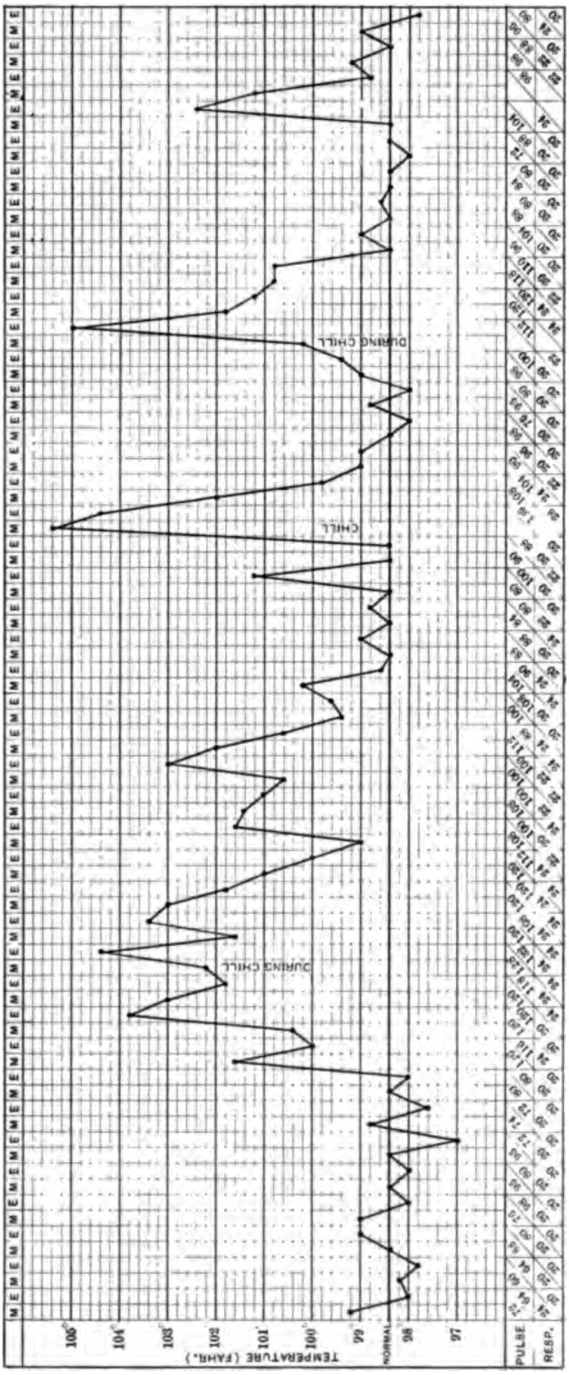


Chart.—Patient admitted to Jefferson Maternity during labor; spontaneous birth, mixed infection, recovery.

cavity. The uterus is softened in these cases, and the danger of perforation very great.

Intrauterine and vaginal irrigation should not be repeated in septic cases; infection is promoted by frequent douching.

Perforation of the Puerperal Uterus.—If the uterus is found very flabby and soft, it is well to omit irrigation until the operator has first gone over the uterine wall gently and thoroughly with the curette. When he is satisfied that the wall of the womb is intact, and that he has dislodged tissue which is ready to come away, then irrigation may be done. Should perforation occur, the curette may be felt to slip further than expected suddenly, and sometimes it is felt by the hand through the abdominal wall. In such cases irrigation should at once be stopped, the uterus tamponed with iodoform gauze, and the abdomen opened as soon as possible. If the perforation is a small one and the peritoneal covering of the uterus is in good condition, it should be closed with fine, chromicized catgut. The abdominal peritoneum and surface of the uterus should be thoroughly sponged with sterile salt solution, and also the posterior cul-de-sac, and a drain of iodoform gauze should be carried to the bottom of the pelvis against the perforated surface and brought out at the lower end of the abdominal incision. This gauze may be removed in forty-eight hours if the symptoms are favorable. If an extensive perforation is found, the operator must choose between resecting the uterine wall at the point of perforation or performing hysterectomy. Where the womb is large and very flabby and the patient's condition grave, Porro's operation is indicated.

Pelvic Complications.—In cases in which an exudate can be plainly distinguished, the pelvic cavity may be entered by opening the posterior vaginal wall. Adhesions must be broken up with the finger, and an iodoform gauze drain or drainage tube may be inserted. If a tumor can be detected in one of the Fallopian tubes, it may be removed through the vagina; or if the parts are so adherent that it cannot be brought down, abdominal section is indicated, with the removal of septic tissues from above.

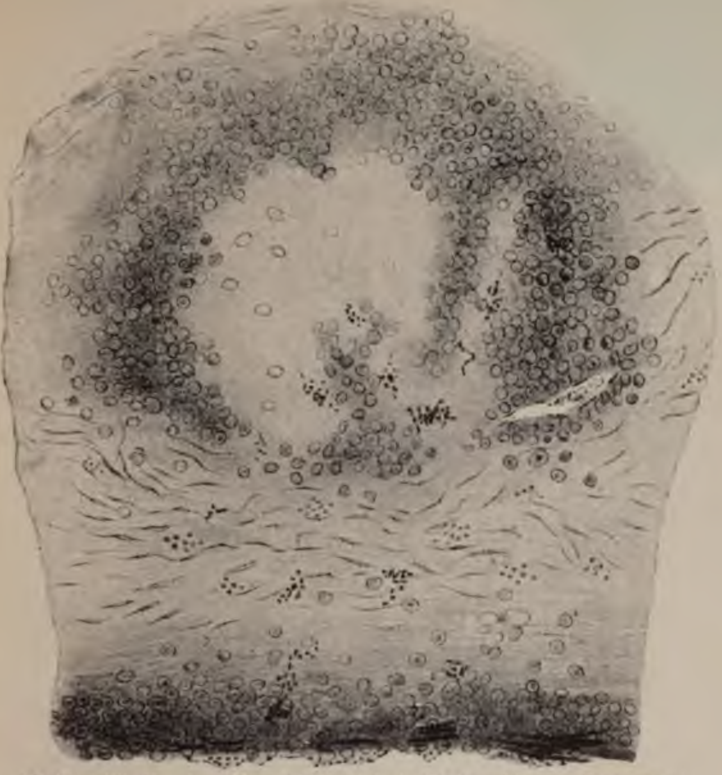
It is best to secure drainage, whenever practicable, through the vagina, and in severe cases the abdomen may be opened, the diseased uterus removed, and a gauze drain carried down through the vagina, the abdominal incision being closed without suprapubic drainage.

Hysterectomy.—Where the puerperal uterus contains a septic fibroid or a placenta which cannot be separated, or has been perforated or ruptured, hysterectomy in puerperal septic infection is clearly indicated. In other cases the evidence at present is not clearly in favor of its performance. If successful, it must be done so early that it may not have been necessary. If done late in the case, it is unsuccessful.

Drainage.—In cases where pelvic peritonitis is beginning, but abscess has not formed, the writer has obtained good results by opening the abdomen, breaking up the recent adhesions which are present, bringing the uterus up to its normal position, loosening the ovaries

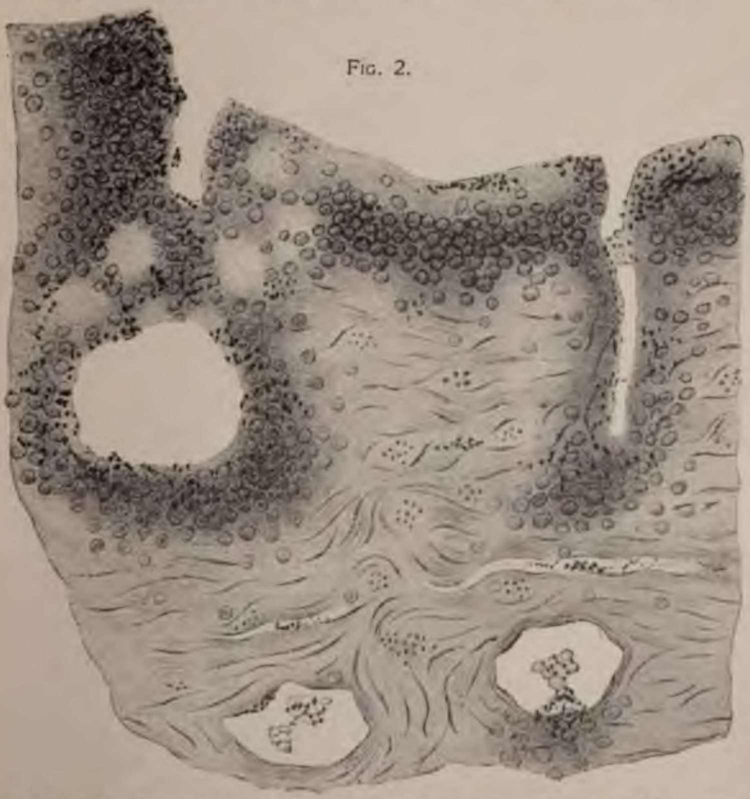
PLATE XXXV.

FIG. 1.



Diphtheritic Sepsis. Mass of Exudate in Endometrium. (GAERTNER.)

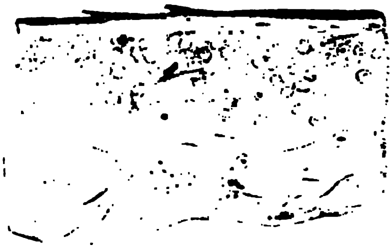
FIG. 2.



sis after Abortion, showing Bacteria and Necrotic Cells around Lumen of Glands. (GAERTNER

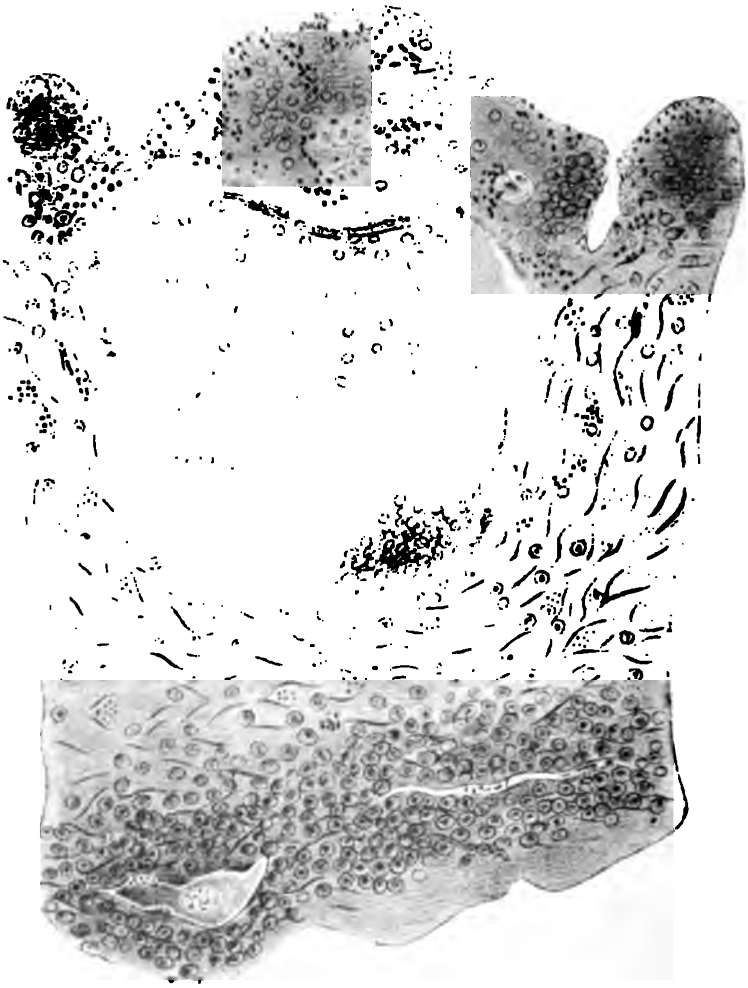
PLATE XXXVI.

FIG. 1.



Diphtheretic Sepsis. Bacteria Invading Muscle of Uterus. (GAERTNER.)

FIG. 2.



Abortion for Vomiting Necrotic Placenta Septic Infection. Death. (GAERTNER.)

and tubes from adhesions, and packing the pelvic space behind the uterus and below the tubes with iodoform gauze. The posterior vaginal cul-de-sac is opened, and the end of this gauze is carried downward into the vagina. The abdomen is then completely closed. The gauze may be gradually removed from below as convalescence proceeds.

Cases of septic infection are sometimes observed in which the infective focus localizes itself in the peritoneal cavity, and by the formation of an exudate walls off its contents from the general peritoneal sac. In neglected cases such a collection of matter finds exit by the process of ulceration, perforating the abdominal wall or burrowing into the rectum or bladder. Wherever such a collection can be discovered it should be emptied and drained, the prognosis being favorable for recovery. If it can be detected by vaginal examination, the vagina should be opened. After incising the most dependent part of the pelvic abscess, it should be very gently washed out with normal saline solution, and the opening kept from closing by the use of a tampon of iodoform gauze. Care must be taken in washing out the cavity that its wall is not perforated, and that no violence is done to the surrounding tissue. The prognosis in such cases is good. The patient, if her strength be sustained, may recover rapidly from a condition of great prostration.

Abdominal Abscess.—When the abscess is in the abdomen, its most protruding point should be carefully located, a simple incision made, and the pus evacuated with as little disturbance as possible. The opening must be kept from closing by a gauze tampon, and the parts be kept thoroughly clean. Should infection not occur through some leak through exudate which had been poured out by the focus of infection, the chances for recovery also in these cases are good. The patient's recovery is necessarily a tedious one. Adhesions very commonly form between the intestinal and the parietal peritoneum and between the uterus and the peritoneum. Should the patient subsequently become pregnant, she may experience considerable inconvenience during the early months of pregnancy. Usually, however, no further operation is requisite in these cases, as adhesions to the uterus gradually become distended and permit the womb to rise out of the pelvis as pregnancy advances.

Infection of the Joints.—In prolonged cases of mixed infection pus may form in any portion of the body. The joints are not infrequently attacked, and must be drained by free incision. Pus may form in the pleural cavity, and the chest must be opened to obtain proper drainage. Phlegmonous inflammation may occur in various portions of the body, requiring deep incision and the evacuation of pus.

Constitutional Treatment.—The constitutional treatment of puerperal septic infection is quite as important as operative procedure. As soon as infection manifests itself the peritoneal cavity should be promptly drained by salines, a teaspoonful of a saturated solution of magnesium sulphate being taken every hour until the bowels move freely. The complaint of pain in the abdomen will often be relieved by the use of turpentine stupes. Where fever is high and developed suddenly, an ice bag laid upon the abdomen is often of value.

The reduction of temperature in septic patients is a matter of great importance, not because fever is in itself fatal, but because fever interferes with the patient's nutrition and reduces her strength. No greater error can be made than to give puerperal septic cases antipyretics. They serve to diminish the patient's strength and power of assimilation, while they obscure the diagnostic features of the case. When the temperature is sufficiently high to annoy and depress the patient, she should be relieved by sponging and bathing or packing with cold or hot water, to which is added alcohol or dilute ammonia. In cases of peritonitis a useful pack for the abdomen is made by using a half-dozen towels, laying them upon ice until they are thoroughly cold, wringing them out, and placing them across the patient's body from the pubes to the level of the heart. If they be changed as soon as they become warm, beginning with the one first placed upon the body, a very efficient pack is thus secured. Patients are occasionally seen who cannot bear cold, but whose fever is relieved by sponging with very hot water. The continuous application of cold or heat by flexible tubing placed upon the abdomen is especially useful. As soon as the patient's fever has yielded to this treatment, she should be given liquid food and stimulants, the amount being limited only by her capacity to assimilate. The best food for these purposes is freshly-made chicken and mutton broth, beef juice, raw eggs beaten with brandy or whiskey, and peptonized milk.

In selecting stimulants those should be chosen which contain a considerable amount of alcohol. Such a patient may take to advantage from one to three quarts of heavy red wine in twenty-four hours, and from a pint to a quart of brandy or whiskey. The tolerance which these patients show to alcohol can scarcely be appreciated by those who have not pushed stimulants in treating this disease. Nourishment and stimulants should be given every three or four hours during the twenty-four. Stimulants are to be continued until the patient's temperature has been normal for several days or until she becomes intoxicated. Should the latter occur, a cup of freshly-made black coffee and sponging the face with cold water will relieve any disagreeable symptoms.

Diarrhœa is often an annoying feature of these cases. It seems to be a compensatory effort upon the part of Nature, and unless it becomes severe it need not be interfered with. Caution should be taken that diarrhœa resulting from mercurial poisoning from the use of bichloride solution does not pass unrecognized. Where bichloride solutions have been used to wash out the uterus, or where frequent vaginal douches have been given to patients debilitated by bleeding, mercurial poisoning readily occurs. We know of no case in which this complication has arisen from the use of bichloride upon the external parts or from the employment of bichloride dressings.

Mercurial diarrhœa soon becomes dysenteric in character, the stools containing blood and mucus and giving great pain. Septic diarrhœa is often painless, the stools containing fecal matter or being serous in character.

Septic patients are often restless and sleep with difficulty. It is best to avoid, if possible, the use of narcotics in these cases. If alcohol and food are pushed, and if the patient has good nursing, she will usually secure sufficient sleep in twenty-four hours without the use of opium. Where, however, pain must be controlled, codeia, in half-grain doses, or morphine, one-quarter grain, and atropine should be given by hypodermatic injection.

Specific Treatment of Puerperal Septic Infection.—The effort has been made to treat streptococcus puerperal infection by a specific remedy, the antistreptococcus serum. While theoretically this treatment should prove most efficient, practically this hope has not been realized. In order to obtain the desired effect antistreptococcus serum must be given in large doses and at repeated intervals. This has produced in some cases symptoms of intense irritation, with anomalous eruptions upon the skin, with increased fever and apparently increased infection. In other cases no result has followed. At the present time no serum for the treatment of puerperal septic infection is available which is a reliable agent.

The use of nuclein to promote leukocytosis has much theoretically to recommend it. Practically, it is praised by some and condemned by others. The writer has not seen benefit follow its use. Silver has been employed by Credé and others as a specific in puerperal septic infection in the form of Credé's silver ointment or by intravenous transfusion of dilute solutions of colargol. Definite evidence is as yet lacking regarding the value of silver in these cases.

Treatment of Septic Infection by Normal Salt Solution.—There can be no question but that this simple remedy has proven of great value. Whether given by rectal injection in high enemata or beneath the skin, or by intravenous transfusion, its use unquestionably results in improvement in the pulse and increase in the secretion of urine, and thus indirectly of great benefit to the patient. It is most useful in cases complicated by hemorrhage and with patients in whom blood tension is notably deficient.

Use of Antipyretics in Puerperal Septic Infection.—No greater mistake can be made than to employ antipyretic drugs in puerperal septic infection. These remedies mask the real condition of the patient, reduce strength, and interfere with assimilation. Quinine is no exception to the rule, for in patients who have no malarial intoxication quinine favors the occurrence of hemorrhage and often disturbs the stomach very considerably.

Essentials of Constitutional Treatment.—The important features in the constitutional treatment of puerperal septic infection consist in free purgation, the control of pain by the use of cold, applied in iced turpentine stupes or an ice bag or coil for continuous flow of ice water, or in the general pack in sheets wrung out of cold water. The free administration of alcohol as a stimulant and antiseptic, tonic doses of strychnia, the care of the skin, the flushing of the kidneys with salt solution or by the plentiful administration of pure water, and those arts of nursing which control and feed patients suffering from fever are essentials. Much can be done to prevent the spread of infection if strict antisepsis of the external genital organs is maintained in these cases.

Infection of the Urinary Tract.—Puerperal septic infection often attacks the urinary tract. If a septic patient be catheterized, infection of the bladder will occur unless the strictest precautions are observed. In cases where gonorrhœa has been present, septic germs may remain in the urethra and excite absorption of poison after labor. Septic infection may travel from the bladder along the ureters to the kidneys, and surgical kidney may be added. The diagnosis of septic infection of the urinary tract is made by examining the patient's urine and by observing her symptoms. The examination of the urine will usually show the presence of pus and bacteria, while blood is present in some cases. The patient will complain of pain over the bladder and of a desire for frequent micturition. The urine will be alkaline, and will be passed very frequently and with pain. If the kidneys become involved, the patient will show symptoms of pyæmia, while enlargement of the kidneys may be detected in some cases. Catheterization of the ureters will determine which kidney is involved.

Septic infection of the urinary tract is one of the most dangerous complications of the puerperal state. It is practically impossible to render the entire urinary tract aseptic, while the hypertrophied condition of these organs during pregnancy favors the rapid development of septic germs.

Treatment.—The treatment of septic infection of the urinary tract consists in douching the bladder with creolin, 1 per cent., or saturated solution of boric acid, from four to six times in twenty-four hours. If the bladder is excessively irritable, the patient may be anæsthetized and the urethra dilated sufficiently to cause spasms of the sphincter of the bladder to cease, or the bladder may be constantly drained by a catheter. The patient's diet should be milk as far as possible, while the action of the bowels should be kept free.

It is important to ascertain which of the kidneys is infected, and hence the use of the cystoscope, with sounding of the ureters, is a procedure of value.

In cases where the ureters become infected each should be catheterized to determine whether more than one is the seat of purulent inflammation. It will often be found that the infection has not reached the kidney, but that only the ureters and the pelves of the kidneys have become implicated. In these cases the ureteral catheter should be passed, and, unless drainage is free, a proper tube may be left in the ureter until such is established, and antiseptic injections of boric acid or normal saline solution may be made daily until the condition passes away. While undetected cases of infection of the urinary tract are very fatal, because the disease insidiously progresses in its upward course, still the results of treatment are sufficiently good to encourage confidence, and to demand that the effort be allowed, and to lead to further effort in perfecting apparatus and the methods of its use.

The pelvis of the kidney is ordinarily susceptible to treatment through the ureteral catheter. The results of such treatment are generally good. Should, however, the infection travel from the pelvis of the kidney into the parenchyma of the organ itself, it is not susceptible to treatment, and symptoms of surgical kidney should lead to a radical operation. This may be incision of the kidney with drainage, or more usually the removal of the diseased organ.

Where it can be shown that one kidney is sufficiently septic to threaten the patient's recovery, the kidney may be removed.

Septic Pneumonia.—The puerperal patient may suffer from pneumonia or bronchitis in their various forms. The occurrence of pneumonia after labor should at once excite suspicion of septic infection, and the physician must satisfy himself that no such complication exists before he can diagnosticate a simple pneumonia. Exposure to cold in puerperal cases may be followed by broncho-pneumonia, which is often severe. The pathology and treatment of this condition in the puerperal woman do not differ from those of the same disease in the non-puerperal.

The prognosis of pneumonia occurring in the puerperal state is at all times grave. If pneumonia be a part of a septic process, it marks transference of an infected embolus and emphasizes the severity of the infection. If the pneumonia be a croupous pneumonia, the prognosis is somewhat better, although the condition is one of great gravity. The treatment of pneumonia in the puerperal state is that ordinarily employed in the non-puerperal patient, with the exception of the fact that additional care must be taken to support the patient's strength and especially to maintain the proper action of the heart. Lactation is generally interrupted in these cases, as is necessary for both mother and child.

Jaundice.—Jaundice may be seen in puerperal patients, and should not be mistaken for simple catarrhal jaundice when arising from septic infection. Cases which perish with pronounced jaundice must be considered as septic unless a post-mortem examination can positively prove to the contrary. Catarrhal jaundice may follow the prolonged constipation of pregnancy, and will usually yield to treatment addressed to this condition.

Thrombosis.—In cases where difficult labor has caused mechanical injury to the veins at the brim of the pelvis, or in cases where such injury occurs during pregnancy, and in patients in whom the blood and the bloodvessels are in an unhealthy condition, thrombosis of these vessels may occur. This complication is especially liable to arise where septic infection is also present. It is not, however, proof positive of septic infection, as cases are seen where such an added complication cannot be proved.

A directly exciting cause of this accident is pressure or bruising of the veins at the pelvic brim. The predisposing causes are septic infection, prolonged or difficult labor, operative procedures for the delivery of the child, and a diseased condition of the blood or the bloodvessels. The symptoms of this complication are pain in the affected thigh and leg, often coming on suddenly, and sometimes so severe as to be described as excruciating. This may follow very shortly after the patient turns in bed or makes an effort to sit up partially. It may follow the application of a tight bandage or dressing about the pelvis. If septic infection complicates this condition, the patient may have a chill and the temperature may rise to 103°, 104°, or 105° F. If septic infection is not present, there will not be a chill, and the temperature will not rise above 101° or 102°. The most usual form of thrombosis is that of the femoral vein, which is not septic in nature, and is not accompanied by phlegmon of the surrounding tissues. The less common form of thrombosis of the lower extremity is that which may affect not only the femoral vein, but one or more of the other veins of the thigh, and which is accompanied by cellulitis or phlegmon.

In thrombosis of the femoral vein the leg swells gradually until its diameter is from one-eighth to one-quarter greater than that of the other. The swelling is at first greatest next the body, but may gradually become almost equal over the surface of the affected leg. The color of the part is of a bluish, pearly-white tinge, which gives the impression of a glistening surface. The leg pits very slightly to pressure, is sensitive to the touch, while the affected vein at its point of obstruction can be outlined beneath the skin and fascia. If palpation be cautiously practised over the femoral vein, an area of sometimes several inches can be found, giving a cord-like feeling to the fingers, and which the patient asserts is painful to the touch. The swelling increases gradually, the tension varying in proportion to the completeness of the occlusion of the vein and the general vigor of the patient. The skin becomes greatly distended, and the glistening appearance is more pronounced. Until the seventh or eighth day after the occurrence of this complication there is little, if any, perceptible change in the diameter of the affected leg. The patient's temperature falls from 101° or 102° to 100°, and by the ninth day it can be noticed that the limb has decreased considerably in size. From this time on, should no further complication arise, the leg gradually diminishes until, at the end of two or three weeks, it is but little, if any, larger than the other. The sensation of pain gradually ceases until the patient complains of stiffness and inability to use the leg only. The skin gradually resumes its normal appearance.

Septic thrombosis may be not only of the femoral, but also of other veins at the brim of the pelvis. It may be accompanied by phlegmonous inflammation of the subcutaneous tissue, which often comes to the point of suppuration, the pus burrowing beneath the fascia and even invading the sheaths of the muscles. Blebs form upon the skin, and their contents may become purulent. This process extends over a considerable area of the thigh, and sloughing may occur, accompanied by the discharge of shreds of connective tissue. Wherever the affected limb presses upon the bed, sloughing is apt to occur, and small bedsores may result. Particles of infected thrombi may be carried to other portions of the body, and a condition of pyæmia gradually results. The patient's fever is considerable at evening, and exhaustion develops and may become fatal.

The treatment of septic thrombosis consists in promptly evacuating all collections of pus. Incision should be made into the thigh as soon as it is evident that suppuration has occurred. These incisions should be douched with antiseptic fluid, and the entire limb should be enveloped in an antiseptic dressing. Blebs should be pricked so soon as they form, and the endeavor should be made to prevent, if possible, the formation of pus and the occurrence of sloughing. The patient requires a vigorous constitutional treatment, consisting of the free administration of alcohol, milk, soup, broths, eggs, beef juice; while, if the stomach permits, quinine, iron, and nux vomica may be given in tonic doses. The burden, however, of continued septic inflammation is frequently so great that the patient finally succumbs.

Cases of thrombosis during pregnancy, while rare, occur sufficiently often to illustrate the fact that mechanical injury without septic infection may bring about this complication. In some puerperal patients thrombosis develops in a very mild degree, not causing a rise of temperature above 101° F., with very little pain, the disorder gradually passing away with but trifling inconvenience. Swelling and difficulty in moving the limb may persist for some time and occasion considerable annoyance.

Œdema of the Vulva.—Extensive œdema of the vulva is observed after severe labor in which the tissues have been bruised or subjected to pressure for some time. The surface of the labia may be greatly distended with serum, and the first impulse of the physician may be to puncture the parts and allow the serum to escape. So great, however, is the danger of infection in these cases that it is best not to do so, and to content one's self with careful antiseptic precautions, with attention to the general condition of the patient, when the swelling and œdema will gradually subside. Should, however, such tissue become infected, abscess must almost certainly result.

Tetanus and other Infections.—The puerperal patient is especially liable to forms of infection other than puerperal sepsis. Tetanus may be conveyed to the lying-in woman, the medium of contagion being sometimes found in non-sterile water which may be used for douches, the antiseptic employed not being sufficiently strong to kill the tetanus-bacillus. To avoid such danger, only water which has been boiled should be employed for irrigation, with the addition of such an antiseptic as seems indicated.

The puerperal patient is especially susceptible to the infection of pneumonia, of tubercle, of cholera, smallpox, influenza, and the exanthematous diseases, as scarlatina and measles, may infect the puerperal patient with serious results. Where another child of the mother has had measles or scarlatina, and the mother is again pregnant, she may, through her care of the sick child, acquire an anomalous form of any of the exanthematous diseases. Thus, a mother may have the bronchial symptoms of measles, after caring for a child who has had the characteristic coryza, without the occurrence of eruption to mark the disease. The course of these anomalous forms of the exanthemata is usually mild, and need not complicate the mother's recovery after labor.

Pneumonia is especially fatal to patients in this condition, either in the form of croupous pneumonia or a catarrhal variety. The patient's power of resistance seems greatly lessened, the course of the disease is usually extensive and rapid, and the patient's strength is very apt to fail some time before resolution might have been expected. The treatment of pneumonia in the puerperal patient consists in the employment of the same remedies which would be used in those who had not borne children, special care being taken to support the patient's strength by the free use of stimulants.

A new field of treatment in these cases is opened up by the employment of various antitoxins in serum for the infectious disorders. Thus, septic infection may be treated by the toxins of the streptococci obtained by modified cultures from the serum of horses. The appropriate toxins for other maladies may be used in like manner. Should diphtheria develop in the family of a patient in the puerperal condition, it would be quite permissible to endeavor to immunize her by injections of antitoxin. The continuance of lactation in these cases must depend upon the severity of the infection and the temperature of the mother. Anomalous forms, with little fever and comparatively little discomfort, may not invariably necessitate the taking of the child from the breast. This is especially true if the mother has been exposed during the pregnancy, and it is quite possible that the fœtus has been in like manner exposed before birth.

Nursing of Puerperal Septic Infection.—The nursing of cases of puerperal sepsis requires thorough knowledge, absolute cleanliness, and great patience and fidelity. If the case be taken with a firm determination to save life, and if the nurse understands how to control fever and how to stimulate and feed, an enormous gain will result for the patient. As lactation commonly fails, the nurse should be competent to prepare milk for the child's use. In severe cases at least two nurses will be required, and their unremitting care will be necessary to sustain thoroughly and support the patient. Her room should be large and airy, and in winter exposed to sunshine, and should be kept at all times thoroughly ventilated.

In caring for a patient who has had septic infection the nurse will require all possible caution to avoid bedsores and to keep the patient in as comfortable a condition as possible. A comparatively narrow bed, such as the single bed, so called, is preferable, with a moderately firm mattress, which is protected by a rubber sheeting. To avoid bedsores, several cushions may be made of sterile cheesecloth filled with absorbent cotton or with borated cotton, which may be placed under various portions of the patient's body which receive the more constant pressure. The patient's skin should be carefully bathed at least once daily. If the patient turns frequently upon her side, these precautions will be rendered much more efficacious in avoiding bedsores. Should the skin break at any point, alcohol and water, equal parts, will be found a very useful application. In addition, powdered oxide of zinc, powdered boric acid, or powdered starch may be employed at any region of the body whenever needed.

Whenever possible, an abundance of linen is desired. If this is not available, any clean and soft material may be used. Whatever is used about the patient should not be employed for another until at least it has been thoroughly boiled. When a patient recovers her linen should be treated as if she had suffered with a contagious malady, and should be disinfected accordingly.

Those who attend such a patient run a considerable risk of personal infection in scratches or lacerations upon the hands. If precautions are taken to care properly for the hands, hang-nails and such lesions will be avoided and the danger of infection greatly lessened. Should, however, septic poison enter, prompt surgical treatment is required. Rubber gloves should be used by nurses attending septic cases in applying dressings and in all manipulations about the genital tract.

Nurses and physicians occasionally suffer from great irritation, caused by the prolonged use of mercurial solutions. Some are affected with eczema, while others experience great annoyance from the prolonged use of creolin.

When such a complication is present, the nurse may anoint her fingers with carbolized oil, oxide of zinc ointment combined with lanolin, tar ointment diluted one-half with oxide of zinc or collodion. Sometimes the change of antiseptic from a mercurial to carbolic acid is efficient in these cases by removing the cause.

Before assuming charge of another case of labor the nurse should thoroughly disinfect herself, as if she had been in attendance upon an acute and contagious malady. The hair should be thoroughly washed, and not only a full bath of soap and water, but also a bath of bichloride, 1 : 8,000, or carbolic acid, 1 per cent., may be employed. Fresh clothing entirely should be put on, and all small utensils, and especially nail-brushes, which have been used during the case should be removed and preferably destroyed. It is better in these cases to use cheap and simple nail-brushes, which are thoroughly efficient. Care should be taken that syringes which have been employed about the patient be destroyed. Anything which has touched the patient and anything which has been used should, if possible, be dispensed with. The room which the patient has occupied must be thoroughly disinfected and fumigated. The bedstead should be washed with carbolic or bichloride solution, and curtains and hangings should also be disinfected. No nurse should assume charge of a confinement case after caring for a septic patient until at least two or three weeks have elapsed, in order that ample time be given for disinfection.

There can be no question about the great danger of infecting one patient from another, and also of the fact that the breasts become infected when septic lochial discharge is brought into contact with them. It is possible, for example, for the patient herself to apply matter from the vagina to the nipples which will create abscess. In patients whose habits are not cleanly the nurse is often obliged to take unusual precautions to avoid the spread of the infection.

CHAPTER VI.

ABNORMALITIES IN INVOLUTION.

Subinvolution.—Among the most common disorders of the puerperal state is that known as subinvolution of the uterus. In these patients the womb, instead of returning to nearly its former size, remains enlarged, while its supports fail to regain their firmness and contractile power. When the patient attempts to leave her bed and to walk, she complains of a sensation of weight and heaviness, with a dragging feeling referred to the back and groins. If such a patient be examined, it will be found that the womb is large, and that, by reason of its weakened supports, it has assumed an abnormal position, usually that of retroversion. A tear of the cervix is often observed in these cases. If such a uterus be subjected to microscopic section and examination, it will be found that the mucous lining is thickened, and that the connective tissue throughout the organ is thickened and heavier than normal, while the muscular tissues show a hypertrophied condition commonly seen during pregnancy. Most of these cases result from septic infection, which prevents the usual return of the uterus, by contraction of its muscles, to its lessened size. This condition is also seen in women who are not septic, but who have gotten up too soon and have too early undertaken their usual avocations. It may sometimes be observed in women who are subjected to great mental strain or privation during the lying-in state.

Prophylaxis.—One of the most important factors in causing subinvolution of the uterus is a lacerated condition of the pelvic floor and a torn and chronically enlarged state of the cervix, with overdistended and infiltrated ligaments, which mechanically prevent the return of the uterus to its normal position, and seriously hinder the retrograde changes in its muscular fibre which constitute normal involution. It is obviously fruitless to treat a patient suffering from subinvolution of the uterus without first ascertaining accurately the condition of the cervix, pelvic floor, and tissues about the uterus, and then correcting any lesion which may be found in these parts. If this be done, the most important cause of subinvolution is removed. It has been already pointed out in discussing the treatment of labor that lacerations should be promptly closed at the time of delivery. If this course be followed, cases of subinvolution in patients so treated will be found extremely rare. If infection does not occur, an equally important cause for this complication has been removed. It is important that after labor the contractions of the womb which tend to produce a proper return to its smaller size should be watched by the physician from the time that the placenta is expelled. During labor the avoidance of exhaustion and proper relief for the mother in all cases of delayed labor, and such general remedies addressed to maintaining her strength as will prevent exhaustion, will naturally prevent failure of involution. After properly conducted labors this complication will very rarely be observed. Successful lactation greatly aids in promoting involution.

Treatment.—Ergot and strychnine are best administered separately to secure uterine contraction. Ergot should be given in the fluid extract, 15 drops three times daily in water. Strychnine may be given by mouth in doses of $\frac{1}{40}$ of a grain three times daily. Where the element of nervous shock or excessive fatigue is not present ergot alone, without strychnine, may be used for the first two weeks after labor to positive advantage. It is useful not only in promoting uterine contractions, but also, by maintaining a tonic condition of the bloodvessels, it favors the secretion of milk. In choosing a preparation of iron in the treatment of subinvolution, that must be selected which will be least apt to favor a condition of constipation. Dried sulphate, the tartrate of iron and potassium, or the citrate of iron and manganese are useful in these cases. In some patients quinine exerts an especially favorable influence, and may be given in capsules with nux vomica, as follows:

Sulphate of iron Sulphate of quinine } each	grs. 30.
Extract of nux vomica	grs. 3.

In 20 capsules, one after meals.

A most useful combination in the treatment of subinvolution is found in iron, ergot, and nux vomica. The following formula has been useful:

Sulphate of iron	grs. 40.
Extract of ergot	grs. 4.
Extract of nux vomica	grs. 2.

In 20 capsules: one three or four times daily with food.

In studying cases of subinvolution the physician must not neglect any predominant general condition which may be the cause of the abnormal state of the uterus. Thus, anæmia may greatly hinder the return of the womb to its normal size. In these cases diagnosis is best made by a microscopic examination of the blood, and treatment should be based upon the results of such examination. In patients with delicate stomachs, pepto-manganate of iron, Fowler's solution, well diluted, peptonized milk and cream, beef juice, peptonized oysters, and other appropriate forms of food should be employed. The useful effects of minute doses of bichloride of mercury in these cases should not be overlooked. Bitter tonics sometimes exert a very happy influence, and seem to stimulate the muscular fibre of the uterus. Tincture of nux vomica and preparations of gentian are among the best. These may be given in the form of cordial containing nux vomica, or in the following combination:

Compound tincture of gentian
Compound tincture of cinchona } each .... oz. 1½
Compound tincture of cardamon
Dessertspoonful before meals.

In patients who have suffered from malaria during pregnancy the result is sometimes seen in positive failure of the uterus to undergo involution. No form of treatment is promptly successful in these cases which does not include the administration of quinine among other remedies. In patients who have taken quinine in large doses, arsenic may be used instead to advantage. Such patients are commonly troubled with torpid livers, and the caution must be observed to secure a thorough action of this important gland before giving the patient quinine or arsenic in considerable quantity.

Massage is of the greatest value in promoting the general recovery of the patient and restoring her muscular tone. The masseuse should not exclude the abdomen in her manipulation after the second week of the puerperal condition. Constipation must be avoided, and if the uterus be found retroverted it should be placed in proper position and maintained there by antiseptic wool or gauze. Where these measures are not successful it is sometimes useful to curette the uterus thoroughly, douching it and packing its interior with gauze. Electricity is valuable in some cases, one pole being placed over the uterus and the other over the lumbar region of the spine.

If subinvolution be recognized during the puerperal period, it is usually amenable to treatment. If it results from undetected septic infection which receives no treatment, an enlargement of the uterus may occur, from which the patient will recover with great difficulty.

Hyperinvolution.—The opposite of subinvolution, or excessive involution of the uterus, is sometimes observed. The causes of this abnormality are, first, profound anæmia, and, second, failure of the mother properly to maintain the tax which lactation imposes upon her. This complication is usually seen in women who nurse a child, and sometimes in those who have an abundant supply of milk. No appreciable symptoms are observed in these cases, except that involution seems to go on even more rapidly than is normal, and no suspicion may be at first excited that anything unusual is occurring. When, however, the patient gets up from her confinement the secretion of milk may gradually fail, and when the child is weaned, or sufficient time has elapsed, menstruation commonly remains persistently absent. Other patients menstruate but slightly and at irregular intervals. Examination in these cases fails to find evidence of inflammation or infiltration of the tissues about the uterus. The womb is considerably smaller than normal and freely movable. Lacerated surfaces seem to have healed, although the cervix has grown much smaller than is usual in these cases through absorption of its tissues. The patient's general condition is one of impaired vigor, but no symptoms of inflammation or distress call attention to the uterus.

Treatment.—The treatment of this condition is rarely successful, because its development is so insidious and the causes which produce it are rarely within the control of the physician. In women not strong prolonged lactation should be avoided, and partial feeding of the child should be begun, if not at birth, within two weeks afterward. This is the most important precaution which can be taken to secure the best possible recovery of the mother. In many of these patients the milk seems to agree with the children, while in others infants do much better when partially or wholly supplied with artificial food. Cases are occasionally seen in which the supports of the uterus undergo such atrophy that prolapse of the womb occurs. In these patients operative procedures are not to be undertaken soon after labor, lest the process of involution proceed so rapidly as to impair the healing. When, however, a reasonable length of time has elapsed, the uterus should be replaced and retained, if possible, in position by some method of suture.

Persistent Uterine Discharge.—Patients may complain, after recovery from labor, of the persistence of a discharge from the uterus. Where this is bright red in color, it indicates that involution is not sufficiently far advanced to permit the patient much liberty in the matter of exertion. She should use as little strength as possible and remain in the recumbent posture until the discharge ceases. A dark, reddish discharge, sometimes grumous in appearance, is seen in cases of partial subinvolution, and in women of gouty or rheumatic habit. Examination will disclose the uterus somewhat enlarged, although evidences of inflammation are not present. These cases should be treated by attention to the general condition, by the use of iron, ergot, and nux vomica, and are often benefited by hot vaginal douches taken at night. If the general strength of the patient is good, she should experience no discomfort on walking. A moderate amount of walking in the open air will be found beneficial. She should avoid the climbing of stairs, the use of a sewing machine, or any exertion which causes her to stand in a strained posture and to reach above her head.

Puerperal Retroversion.—In patients who have remained persistently upon the back, and who have used a tight abdominal binder, and in whom the tissues are relaxed either by laceration or from abnormality in the condition of the muscles of the genital tract, the uterus is often found retroverted at the end of the second or third week of the puerperal period. If a patient tries to walk at this time, she may complain of a disagreeable sensation in the back. Should the condition persist and the uterus be forced downward as well, there will be dragging sensations and pain in the back, and sooner or later a catarrhal condition of the cervix will probably develop.

No puerperal patient should be allowed to be much upon her feet before a vaginal examination has been made. So soon as the lochial discharge has ceased, such examination is indicated. If the uterus be found retroverted, the patient should be placed in the knee-chest posture, the vagina should be distended with air, and the uterus should be replaced by pressure made upon the fundus through the posterior cul-de-sac. Manipulation should be very gentle, and the uterus should be carried to one or other side of the promontory of the sacrum if the sacrum seems to be an obstacle to its replacement. It is often impossible to replace the uterus immediately, but by gentle manipulation the fundus will be found to rise gradually in the pelvis and finally to pass above the promontory of the sacrum. The finger should then be placed upon the anterior surface of the cervix, and the cervix should be carried backward and upward. By this procedure the uterus is anteverted, and usually remains in good position.

After replacing the retroverted puerperal uterus, the patient should assume the knee-chest posture twice daily for several weeks. If this is not sufficient, a retroversion pessary, with large, soft posterior bar, should be used. A pessary should not be inserted if there is tenderness upon pressure in any portion of the pelvic tissue about the uterus. When such tenderness is found, the uterus should be replaced in the knee-chest posture and a tampon of carded aseptic lamb's wool should be placed in the posterior cul-de-sac while the patient is in the knee-chest position. This may be worn forty-eight hours and then removed, and a vaginal douche of lysol, 1 per cent., given. The bowels should be kept open, and the patient should avoid constriction by clothing. It is usually possible, after a few weeks of such treatment, to fit a permanent support. If retroversion of the uterus depends upon an extensively lacerated condition of the pelvic floor, this, obviously, must be first repaired.

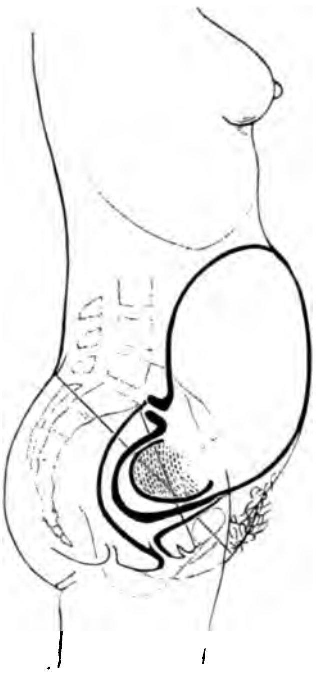
Persistent Cervical and Vaginal Discharge After Labor.—Patients are sometimes annoyed by the persistence of a mucous or muco-purulent discharge from the vagina after labor. A simple mucous discharge usually occurs until the mucous membrane of the vagina has undergone perfect involution. The persistence, however, of a muco-purulent discharge should call attention to the fact that granulating and unhealed surfaces are present in the genital tract. This may be in the cervix or may come from healing portions of the pelvic floor or vagina. This condition is generally cured by appropriate douches. Lysol is one of the best substances for this purpose, and may be used, one teaspoonful to the quart of water, night and morning. If its odor is disagreeable to the patient, boracic acid may be employed instead. Simple hot douches are often useful, while douches of bichloride solution, 1 : 5,000 or 1 : 8,000, are often of value, alternating with lysol injections. If treatment of this sort for a reasonable time does not cure the condition, the parts must be exposed by a speculum, granulating surfaces scraped with a sharp curette, painted with tincture of iodine, 1 part; carbolic acid, 1 part, and glycerin, 2 parts; and douched with antiseptic solutions. The muco-purulent discharge in these cases often comes from enlarged follicles in the glands of the cervix. With these patients the cervix should be exposed by a speculum, thoroughly cleansed with bichloride solution, 1 : 5,000, and the follicles pierced by a knife and the diseased surfaces touched with the iodine and carbolic acid mixture just described. The use of the curette after puncture of the glands is often valuable. This procedure does not require an anæsthetic, but should be done with strict cleanliness, care being taken that no instrument or injection enters the uterine cavity. It is best performed at the house of the patient, in order that she may retain the recumbent posture for several hours afterward.

In cases where vaginal catarrh persists after labor especial attention should be given to the general condition and nutrition of the mother. The drain of lactation or prostration following prolonged and difficult labor will often serve to keep up a catarrhal discharge from the vagina, which otherwise would have disappeared in a short time. When the general health has been attended to, suitable injections should be used, and these preferably of weak solutions of lysol. These remedies are usually quite sufficient to bring about in a short time the cessation of the discharge.

Involution Complicated by Previous Operations upon the Uterus. —An interesting and important complication has been added to pregnancy and the puerperal state from the effects of operations, done before pregnancy occurred, to remedy disease and malposition of the genital organs. Of these, the most common is some form of suspension or fixation of the uterus, to remedy a pre-existing backward displacement. Three operations are practised for the relief of this disorder, namely, shortening of the round ligaments, fixing the uterus to the peritoneum on the anterior surface of the abdomen, or uniting the uterus to the connective tissue in the anterior vaginal wall. It is evident that just in proportion as the uterus is left free to develop normally during pregnancy, in just this degree will the labor be uncomplicated and the puerperal state afterward normal. The operation which interferes least with labor and the puerperal state is the shortening of the round ligaments. This brings the uterus forward before pregnancy in something very like its normal position, and does not necessarily produce adhesions between serous surfaces. As pregnancy advances the round ligaments hypertrophy and stretch, and during labor the uterus is left free to contract and after labor to undergo its customary involution. As the uterus develops symmetrically during pregnancy and in its normal position, the development of its various surfaces is untrammelled, and hence no special distention is brought upon either anterior or posterior wall. While this operation may not be as certain of success in the non-pregnant as are some others, still it is least injurious to the conduct of labor and the process of involution.

The second form of operation consists in uniting the serous surface upon the posterior wall of the uterus at the fundus with the peritoneal lining of the anterior wall of the abdomen. With the exception of the adhesions so forming, the uterus is left free to develop during pregnancy and free to contract during the progress of labor. Peritoneal adhesions stretch so readily when recent that the womb is but little impeded as it rises out of the pelvis. During labor the uterus may contract less strongly, and the retraction of the uterus and descent of the fundus may be somewhat interfered with by the results of the operation. The posterior wall of the uterus will not develop as symmetrically as does the anterior, nor will it dilate to accommodate the fœtus, the result being that the fœtus finds more room against the anterior wall. The anterior wall may become dangerously stretched,

FIG. 157.



Pregnancy and beginning labor in a case in which the uterus had been sutured in the anterior vaginal wall. (STRASSMANN.)

the fœtus forming a sac for itself in the distended portion of the womb.

The third method of correcting backward displacements by operation consists in what is termed vaginal fixation, by uniting the uterus to the connective tissue of the vagina. The effort is made by some to avoid the disadvantages of the previous operations by uniting the anterior wall of the womb with the connective tissue beneath the mucous membrane of the anterior wall of the vagina. The effect during pregnancy and in labor is most disastrous. The cervix and vagina are drawn upward as far as the structure of the tissue will permit; the fœtus develops in the posterior portion of the uterus. Labor is often impossible because the os and cervix are drawn upward, the fœtus presenting at the brim of the pelvis and forcing downward the anterior wall of the lower uterine segment—an anomalous and difficult position. It has been found so absolutely impossible to deliver the patient through the vagina that cœlio-hysterotomy has been done for this condition.

The puerperal period in these patients does not differ essentially from that of the others, with the exception of very tardy involution of the uterus. If they have been delivered by operative procedure, their recovery is, of course, complicated by the after-care required for patients delivered by operation. Especial care must be taken in these cases to see that the uterus is in such a position that the lochial discharge can readily escape. Especial care is required during the puerperal period to keep the uterus in its proper place in the abdomen, to retain it in its position by an appropriate binder, to keep the bowels from becoming constipated, and to reinforce the patient's strength in every possible way.

CHAPTER VII.

PATHOLOGY OF LACTATION.

Septic Mastitis: **Etiology.**—Septic infection in the mammary glands may result from the direct conveyance of infective bacteria through a wound in the mucous membrane of the nipple or from the growth and development of bacteria contained within the breast before labor. Those causes which directly predispose to mastitis are interference with the free discharge of milk and the engorgement or congestion of the breasts which such interference causes. Mechanical injury also predisposes to infection by wounding the tissues, by causing extravasation of blood in the parenchyma of the gland, and by interfering with the free discharge of milk. Exposure to cold, producing congestion, also favors the development of puerperal mastitis.

Signs and Symptoms.—The signs and symptoms of puerperal mastitis vary with the portion of the gland infected and the severity of the infective process.

Infection may be limited to the nipple only. In these cases a crack or fissure or wound of the nipple is present, and surrounding it an area of swelling with or without the formation of pus. In the experience of the writer a young primipara, who determined not to nurse her child, soiled her fingers with lochial discharge, and then pinched and bruised the nipple until infection was produced. Fortunately, this was promptly discovered, the focus of infection opened and drained, and the remainder of the gland escaped. In some cases small cysts or blebs form upon the nipple from irritation of the epithelia, and these may become infected. The nipple itself is rarely infected without the spread of the infection to the areola surrounding it. Such infection rarely extends throughout the entire areola, but is limited to one portion. An infection in the nipple and areola, unless promptly checked, will spread through the lymphatics to the parenchyma of the gland itself. Recalling the anatomy of the breast, we remember that it is composed of a number of mammary glands, like bunches of grapes, whose stems converge to the nipple as the point of discharge. Infection is usually first limited to one of the acini. A hardened, sensitive area appears usually on the lower and outer quadrant of the breast, which can often be traced from the periphery to the nipple. In patients of delicate skin a slightly reddish discoloration may be present in the beginning, and this will increase as the infection goes on to suppurative inflammation.

Infection is rarely limited if not promptly treated to one acinus only. By palpation a hardened area extends over a considerable portion of the breast, with corresponding increase in pain upon manipulation. Fever ranging from 101° F. to 103° F. is present; the pulse rate is increased considerably. Digestion is usually disturbed, the effort to nurse the child causes pain, and the patient may have a slight rigor or chill. The glands in the axilla are usually tender upon deep pressure, and sensitiveness is sometimes so great that even respiratory movements are painful.

As the disease progresses, if pus forms in considerable quantity, fluctuation can be detected by palpation. In neglected cases the skin over the infected area becomes dark red or brownish, and finally ruptures, giving exit to pus. If suppuration burrows beneath the breast through the subjacent fascia, an abscess may form beneath the mammary gland. The whole gland will be raised upon the abscess, and will give a sensation of indistinct fluctuation and mobility upon manipulation. In neglected cases the physician may find spontaneous openings in the mammary gland, and also the presence of pus beneath the fascias near the axilla.

Diagnosis.—The diagnosis must be made between simple engorgement of the breast and mastitis. In the former there is little elevation of temperature, the pulse is little disturbed, fluctuation is absent,

FIG. 158.

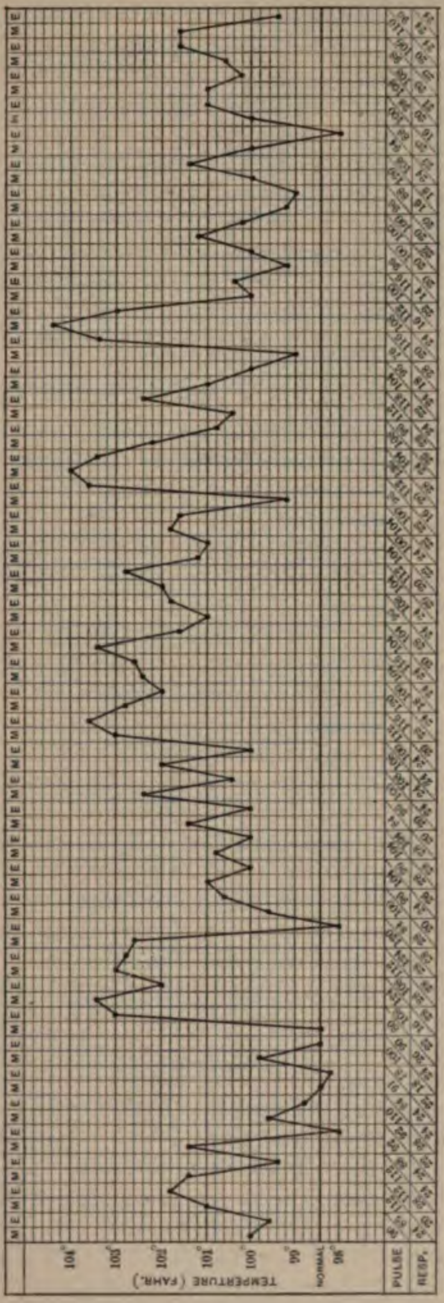


Chart.—Puerperal septic mastitis with abscess.

the application of appropriate treatment brings relief, and the symptoms steadily subside and soon disappear. In mastitis with abscess fluctuation is present, there is considerable disturbance of pulse and temperature, nursing is painful, there may be pus discharged with the milk, redness and tenderness develop over the infected area, and the presence of pus ascertained by incision or rupture of the abscess completes the diagnosis.

Prophylaxis.—The prevention of puerperal septic mastitis requires first the avoidance of engorgement in the breasts. When infection has occurred, drainage is necessary. In some cases the infective process travels along the ducts of the acini without forming a collection of pus at any one point. In these patients drainage is effected by the discharge of milk; bacteria are abundant in the milk, and if the breast is thoroughly exhausted abscess may be prevented and the case go on to recovery.

The diagnosis of abscess in the mammary gland is often a difficult matter. Fluctuation may not be clearly defined, redness and swelling may not be evident, and the physician must base his opinion upon the constitutional symptoms, upon engorgement of the breast, and marked tenderness over one area. Under these circumstances, incision may be made under antiseptic precautions; and should it be found that abscess has not formed, incision followed by gauze packing will prevent its formation.

Treatment.—The treatment of septic infection of the breasts consists in incision and drainage under antiseptic precautions. The breasts should be thoroughly cleansed with soap and water, rinsed with water, and then washed with bichloride solution, 1 : 2,000. In cases where only the region about the nipple is infected, a short incision should be made over the point of fluctuation, and the pus allowed to escape. The infected pocket should then be thoroughly washed out with hydrogen peroxide and tamponed with iodoform gauze, and a dressing of bichloride gauze and cotton should be placed over the breasts, which are tightly bandaged. If infection has spread no deeper than the nipple and areola, the pain and swelling will subside and the pocket will speedily granulate.

In cases where a lobule of the breast has become infected and formed an abscess, the location of the pus can be mapped out by deep fluctuation. The patient should be anæsthetized and the parts thoroughly cleansed; an incision should then be made parallel with the nipple, over the point of greatest fluctuation, and carried sufficiently deep to open the pocket thoroughly. The knife should not be turned transversely through the nipple, as milk-ducts may be severed by so doing. The abscess should then be thoroughly washed out, and the finger inserted and an effort made to discover other abscesses connected with the first. If the breast be found riddled by pus, a counter-opening should be made in the most dependent portion and a drainage tube passed from above downward. Where, however, but a single cavity is found, it should be disinfected and packed with gauze. In neglected cases in which suppuration has persisted for some time, it is well to curette the abscess cavity before washing it out. The gauze tampon should be removed gradually, and the cavity be made to close from the bottom. Under good surgical care abscesses of the breast rapidly heal, and if they be opened promptly but little damage will be done to the secreting portions of the breasts.

Lactation must be checked, if possible, in septic breasts, and this can be accomplished by tight bandaging and by avoiding nursing and the use of the pump. In subsequent pregnancy the patient who has had mammary abscesses may experience trouble when the breasts fill with milk.

Especial precautions must be taken to avoid distention and fresh infection. If this be done, such patients will often escape annoyance and furnish a suitable secretion of milk.

Engorgement of the Breasts.—The mother may suffer during lactation by reason of an excessive amount of milk. Painful distention of the breasts may result, and acute suffering at the time when the child nurses. The treatment of this condition consists in removing the surplus milk by breast pump before the child nurses. If the breast be thoroughly cleansed with saturated solution of boric acid and the nipples be drawn out gently by the thumb and finger, the glass bell of a breast pump may be applied gently over the nipple and a vacuum created. It will be necessary to remove only a little milk to enable the child to nurse freely and relieve the mother. The amount to be removed must be carefully estimated, and just sufficient taken away to relieve the distention. If more than this is extracted, the breasts will be stimulated to furnish an increased amount.

The distention of the breasts which accompanies excessive secretion will be best relieved by gentle massage and by raising the breasts and by gently compressing them with an appropriate bandage. The base of this should draw the breasts upward and toward the median line. This may be accomplished by a figure-of-eight bandage, or preferably by a breast binder, to which are attached suspenders passed over the shoulders and crossed behind over the back. This binder is pinned or buttoned in the middle between the breasts, and by varying the attachment of the suspenders traction can be made in any desired direction.

Massage of the Breasts.—Where the milk shows a tendency to accumulate in the milk-ducts, forming small lumps or areas of hardness, this can be largely obviated by gentle massage. Before this is done the breasts should be washed thoroughly with soap and water, and then with bichloride, 1 : 5,000. The hands of the nurse should be thoroughly cleansed with soap and water, rinsed, and scrubbed in bichloride, 1 : 2,000. Sterile olive oil should be employed, as it aids very materially in maintaining a soft condition of the breast. The nurse should grasp the breasts gently with both hands at their base, raising the breast upward and toward the middle line. While one hand holds the breast in this position, the other should make gentle compression and stroking motions from below upward. By alternating the action of the hands this may be done round the entire circumference of the breast, thus thoroughly relieving and softening distended lobules. Milk is frequently brought from the breasts during massage, an indication that engorgement is being relieved. If this manipulation is painful to the patient, it should be at once abandoned, and in place compression employed by a bandage as tight as is comfortable. Where an area of sensitiveness and redness develops, infection has occurred, and massage will simply aggravate a beginning inflammation. Massage may be performed once or twice daily, and is often made more efficient if the excess of milk is removed by a breast pump at the same time. Massage is also a stimulus to the flow of milk in cases where it is deficient. This fact should be remembered where massage is done for engorgement, and hence manipulation should not be repeated more often than is necessary to relieve overdistention. Massage of the breasts requires skill and gentleness and good judgment, and, when thus employed, it is a valuable method of treatment. If done, however, without such caution, it may cause considerable injury.

It is well to limit the amount of fluid which patients take who are annoyed by excessive secretion of milk. The mistake, however, must not be made to curtail a patient's diet too closely, thereby weakening the patient and decreasing her general strength. It is better to extract a considerable quantity of milk, and to allow the secretion to diminish slowly, than to underfeed the patient.

Cases of excessive distention of the breasts require careful and very assiduous treatment. When the tension upon the gland is so great that the child cannot start the flow of milk by suction, the use of hot applications may be necessary to soften the breast. This should immediately be followed by massage and then by the use of the breast pump. When some milk has been removed the tension will be so much lessened that the child can readily nurse. Good judgment on the part of the nurse is required to recognize the indications for the different steps in this treatment. We have found it important that the sequence which we describe should be followed in these cases. If massage be attempted too soon while the breast is exceedingly tense, the tissues will be bruised and infection will be promoted. Unless the pump be used to remove a portion of the milk, the child will be unable to nurse, but in the order given, and in the hands of a good nurse, these procedures have proved remarkably successful.

Deficient Secretion of Milk.—A deficient secretion of milk is most often observed in nervous women and in those who have been subjected at labor to great fatigue, hemorrhage, or shock. In the latter case, if stimulants and food are properly given, the patient will rally in a few days, and the secretion will rise to its normal amount. Where, however, a patient is neurotic or deficient in general nutrition, the physician must not wait for improvement in the patient's general condition, but must feed the child from the beginning, allowing it also to nurse the mother. The secretion of milk may be augmented by placing the child at the breasts at regular intervals, or by using the breast pump regularly if there is no fluid to satisfy the child.

Gentle massage of the breasts is also an aid, while the application of the interrupted current of electricity, one pole being applied to the dorsal spine and one to the breasts, has been found of value.

The patient's diet in these cases should contain an abundance of fluid, with fat and a reasonable amount of sugar. Milk, soup, broth, cocoa, and gruels are indicated, with a free amount of water. Tea has a reputation among women as a stimulant to the formation of milk, while coffee is said to lessen the flow. Neither of these beliefs is based upon accurate observation.

Where the formation of milk is deficient, the assimilation of the patient is usually at fault. The intestinal tract will be found sluggish in action, and often a constant tendency to malassimilation, as in the gouty or rheumatic person, is present. The peculiarities of each patient must be studied and the treatment prescribed accordingly. In gouty women who have been accustomed to eat largely of meat, beef and pork may be withdrawn from the diet and the lighter meats substituted. Such patients should take an abundance of water, and especially of the lightest alkaline or effervescing water. If milk itself cannot be well digested, it should be peptonized, care being taken that a considerable amount of cream is consumed with the milk. Many patients thrive upon an abundance of ripe fruit and vegetables in season. Some digest cocoa and chocolate well and profit by them. Those who have been accustomed to use wine and beer may often experience benefit from them, while some do well with extract of malt. Stout and porter have a great reputation for furthering the flow of milk, and agree with some patients. With others, however, they are not assimilated, and serve to disturb digestion and injure the patient. The question is often asked whether substances containing acids should be taken by patients who are nursing a child. This will depend entirely upon the assimilative powers of the person. The fruit acids found in ripe fruits and in some forms of vegetables, if taken in moderation, often do not disagree with the mother, but, on the contrary, promote her digestion. The use of a small amount of vinegar upon plain salad, with oil, need occasion no disturbance to the child if the salad is digested by the mother. It is the formation in the intestine of irritating acids from fermenting food which more often causes an irritating condition of the milk than the consumption of moderate amounts of fruit acids.

Where it is necessary to prescribe tonics for these patients, arsenic will be found especially useful. This may be given in Fowler's solution, well diluted, beginning with one drop three times daily, and advancing to five and then returning to one. A bitter tonic, as gentian, may be combined with arsenic to advantage. Tincture of nux vomica may be used in small doses without disturbing the milk, and often serves as a useful tonic. Preparations of iron most easily assimilated by the patient will give the best results in the formation of milk.

Failure in the Secretion of Milk.—Women are sometimes seen to fail absolutely in the formation of milk. There is no apparent reason for this anomaly, as many of these patients are robust and seem exceedingly well developed. In some of these cases there is an evident failure in the development of the nervous system governing the genital tract. Some of these patients have very deficient labor pains, and must be delivered by the use of forceps. In others gout or rheumatism lies at the basis of failure of secreting milk, while in others the age of the patient, if she be considerably beyond the usual period of childbearing, seems to be an important factor. In these cases a faithful effort must be made to stimulate the formation of milk by applying the child to the breast and by the use of the breast pump, with massage. The child, however, must be fed in order that it may thrive, and that the mother may be relieved of the anxiety and disappointment which her failure occasions. If, however, at the end of five or six days no secretion of milk appears, the breasts remaining perfectly flaccid, it is probable that failure of lactation is present. These patients sometimes show a corresponding slowness in the involution of the genital tract. The uterus becomes small more slowly than in women who nurse a child, and the recovery of the patient is somewhat delayed. Especial care must be taken in these cases by giving ergot and iron, by the use of douches, by massage, and, if necessary, by curetting, to secure proper involution. In other cases involution proceeds even more rapidly than normal, although lactation is not present. It is also true that the secretion of milk may partially or even entirely fail from a deranged condition of the nervous system. Thus, a young woman may begin to nurse her child successfully, and a cause of chronic nervous irritation, as some domestic trouble, may bring about a gradual and total failure of her milk. If the physician can recognize the complication present sufficiently early, he may begin to feed the child before the failure of milk actually occurs. In this way he will be in a measure prepared and forearmed against the mother's failure. It is of great importance in these cases to relieve the mother of the mental anxiety that she is not nourishing her child, and if the child be partially fed it is much easier to keep up her secretion of milk than if she feels that the child is entirely dependent upon her.

The nervous system has an important influence upon the secretion of milk, and hence anxiety and strain should be avoided if possible. If the patient is apprehensive, measures should be taken to allay her fears. In women of good constitution hope should not be given up that a reasonable secretion of milk will occur until a week has passed without the establishment of the flow. As soon as it is found that the child is not obtaining sufficient, it should be fed at regular intervals and allowed to nurse at times in proportion to the amount of milk present.

Abnormalities and Injuries of the Nipple.—Cracked and fissured nipples and malformation of the nipples occasion great annoyance to nursing women. Any wound or injury to the nipple exposes the patient to the danger of infection through such a lesion. Care should be taken to render the epithelial covering of the nipples in a healthy condition by suitable applications during pregnancy. These should be such substances as will tend to heal any slight abrasion and render the nipple soft and pliable. A very useful application is an ointment of cosmolin and lanolin, containing ten grains of powdered boric acid to the ounce. When it is found, however, upon the child's nursing that the nipple is sore, special precaution must be taken to avoid infection. The entire breasts should be thoroughly washed with soap and water and bichloride solution, 1 : 5,000. The nipples should be cleansed with saturated solution of boric acid before and after each nursing, and also anointed with boric ointment. It is well to apply the breast pump for a few moments before the child nurses, as the first coming of the milk through the nipple is often exceedingly painful. A nipple shield may be used to advantage, and, if the milk be started with the pump, the child can often obtain its food without difficulty. The best nipple shields are composed of a single glass bell to which is attached a rubber nipple, without a tube, and can usually be employed with great comfort to the patient. If scrupulous cleanliness be maintained and patience be exercised in the use of the shield and pump, the majority of cases of fissured nipples will recover without abandoning the nursing of the child. In cases, however, where infection of the nipples results, an effort may be made by touching ulcerated surfaces with nitrate of silver to check the infection without abandoning the use of the breasts.

Checking the Secretion of Milk.—Cases arise in which it is necessary to check the secretion of milk as rapidly as is consistent with the patient's safety. It must be remembered that the secretion will gradually cease if the breasts are not nursed or pumped. The breasts should be thoroughly cleansed, and covered with a light layer of aseptic cotton. A breast binder should be applied as tightly as is comfortable. The patient may be given saline laxatives until the bowels move copiously, and her diet restricted in the matter of liquids.

If strict cleanliness has been observed, the patient will not have breast abscess, nor will she suffer serious consequences from distention. The breasts may become somewhat caked, but this will gradually disappear without injury to the patient. Various drugs have been tried in different ways to check the secretion of milk. Belladonna has been given to some advantage, although its utility is but limited. Where the patient suffers from overdistention, the breasts may be very gently rubbed and sufficient milk only extracted to relieve the tension.

To relieve overdistended breasts the following preparations of belladonna have been employed: A solution of atropine, four grains to the ounce, has been applied to the breast by moistening a circular piece of surgeon's lint, three inches in diameter, and laying it upon the breast, retaining it in place with a bandage. Others have employed belladonna ointment of the Pharmacopœia, rubbing a portion of the ointment as large as an English walnut into the breast with massage. Others have given belladonna internally in the form of atropine, $\frac{1}{100}$ of a grain, two to three times daily, or tincture of belladonna, 20 drops, three or four times daily. While many claim that this remedy has great efficiency, it is often impossible to say whether belladonna or other agencies employed at the same time have been efficient.

In cases where it is desirable to lessen the distention of the breasts and the secretion of milk, the patient's diet should contain as little liquid as possible. Fluid should be abstracted from the body by very free purgation by salines. While such treatment cannot be continued for a long time without injuring the mother, for several days it will be found most efficient. Free saline purgation at intervals of a week or ten days will be of great service in managing these cases.

Abnormalities in the Composition of Breast Milk.—It is often of importance to ascertain the composition of breast milk to determine its fitness for the food of the child. Its reaction should be alkaline; it should contain a considerable amount of cream; while, upon microscopic examination, bacteria should be absent. Milk globules should be abundant, large, and smooth in contour; the color of the milk should be a pearly-white. In cases where the milk contains too large a proportion of colostrum, the colostrum corpuscles will be present in abundance, while if infection has occurred, bacteria and pus will be found.

Several ounces of milk taken by the breast pump with antiseptic precautions should be subjected to chemical and bacteriological examination. By this means the percentages of fat, proteid, and sugar present in the milk may be ascertained, and also the presence and variety of bacteria. Such examination furnishes the most accurate basis for a decision to alter the mother's diet or to substitute artificial feeding.

Breast Milk Affected by Drugs and Foreign Substances.—In considering the influence of drugs upon a nursing infant, it must be remembered that drugs affect a child often in proportion to their solubility. Thus, the bromides, iodides, and chlorides very notably influence the composition of milk. Alkaloidal substances may also be absorbed in sufficient quantities to affect the nursing child. Combinations of the metals less often influence the composition of breast milk. Certain fruits and plants contain principles which influence the nursing child. Thus, rhubarb given to the mother will purge a child, as will also colocynth or elaterium. Asparagus will sometimes affect the composition of the milk, while the pronounced vegetables in taste and odor, as onions and garlic, directly affect the odor and taste of milk. Mothers vary greatly in their susceptibility and that of their children to various drugs and substances, and each case is a matter for careful observation rather than for routine prescribing.

Galactorrhœa.—An excessive secretion of milk is sometimes observed, and is a troublesome complication. It is often seen in ill-nourished, anæmic women, in whom food taken seems to result more in the formation of milk than the making of the blood. Many of these women are of diminutive stature and very badly developed. An examination of these cases will usually reveal the fact that the blood of the patient exhibits the signs of anæmia. These women are often found to have been subjected to undue strain from labor, from exhausting illness before childbirth, and bad hygienic surroundings; from unfavorable climate or from a continued cause of nervous and mental depression. In dealing with these patients, they must be carefully examined to determine any condition of anæmia or visceral disease which may be present. The treatment of anæmia must be thorough and vigorous, arsenic and iron being used with freedom. The child should also be partially fed, as a diminished demand from the mother is usually met by a diminished secretion. The breasts of the mother should be constantly compressed by a carefully fitted and snugly applied breast binder, with supports over the shoulders. The mother's diet should .contain as little liquid as is compatible with health, and gruels, cocoa, milk, sugar, and starches should be taken with great moderation. Some drugs have a reputation for lessening the supply of milk. Among these is belladonna, ergot in considerable doses, hydrate of chloral, the bromides, antipyrin, and iodide of potassium. All, however, are distinctly inferior to the methods of treatment already described. Where a change of climate can be secured, taking the mother to the seashore or into the country, the result is often most satisfactory. If the condition of the uterus or pelvic floor demands it, any pathological condition found there must be corrected. Although this complication is often obstinate, it rarely fails to yield to intelligent treatment.

Duration of Lactation.—The duration of lactation is dependent upon various conditions. Should the mother become pregnant the secretion of milk will cease, although colostrum may remain in the breasts. Lactation may be suspended by anæmia, or any intercurrent disease which destroys the patient's strength.

Nature would seem to indicate that the child should nurse until it obtains sufficient teeth to enable it to begin a mixed diet. This would require that lactation should continue from a year to eighteen months after the birth of the child. As a rule, however, it may be said that healthy women may nurse a child to advantage, if placed in comfortable circumstances, from eight months to a year.

Treatment of Disturbance in Lactation.—Lactation may be greatly disturbed by the acute infections. Thus, a nursing mother may be attacked by enteric infection or pneumococcus infection, or other of the contagious and infectious maladies. Her milk is unfit for the nourishment of her child while she is suffering from such disease. If the infection be severe, the secretion of milk will be checked by the fever and by the effect which the infective agent produces upon the nervous system.

A condition of profound anæmia in the mother also forbids the continuance of nursing. Such patients often have an excessive quantity of a thin, milky fluid, greatly deficient in solids and nutritious material. Temporary disturbance in lactation may arise from irritation of the nervous system, errors in diet, exposure to cold and wet, or the depressing influence of excessive heat or excessive fatigue. Menstruation also disturbs lactation during the performance of this function.

This temporary disturbance in lactation may be recognized by diminution in the quantity of milk secreted, by indigestion and colic in the infant, and by the child's failure to gain steadily in weight. Under these circumstances, the general hygiene of the mother must be carefully examined, and such changes made as will, if possible, remove the disturbing element. Rotch's directions[182] are as follows: "To increase the total quantity, increase proportionately the liquids in the mother's diet and encourage her to believe that she can nurse the child. To decrease the total quantity, diminish proportionately the liquids in the mother's diet. To increase the total solids, shorten the nursing intervals, decrease the exercise, decrease the proportion of liquids in the mother's diet. To decrease the total solids, prolong the nursing intervals, increase the exercise, and increase the proportion of liquids in the mother's diet. To increase the fat, add meat and easily digestible food to the mother's diet. To decrease the fat, diminish the proportion of meat in the diet. In the rare cases where it is desired to increase the proteids, the mother should exercise to the limit of reasonable fatigue."

It must also be remembered that, within reasonable limits, frequent nursing stimulates the secretion of milk, while excessive frequency in nursing annoys and wearies the mother and diminishes the supply.

Mixed Feeding.—Cases often arise in which it is desirable to supplement the mother's supply by the addition of cow's milk. This method has several advantages for mother and child. It gives the mother more freedom from the care of the child, enabling her to remain away from the child from four to six hours, and it accustoms the child to a nutrition other than the mother's. Should the mother become ill, the child can be fed entirely upon cow's milk with but little disturbance; and should the child become ill, its appetite will be satisfied by the quantity of mother's milk still remaining. In supplementing mother's milk it is well to begin with partially-digested milk. Pancreatizing materials are readily obtainable, with directions for their employment. We have found satisfaction in the use of Fairchild's peptogenic powder. By means of this a beginning may be made in artificial feeding without disturbing the child's digestion. When the child has become accustomed to cow's milk thus prepared, the change may be made to milk modified without predigestion. Here a very dilute formula should be selected, even though the child be strong and vigorous. It is well to begin with a formula calling for fat 2, sugar 6, and proteid .6 of 1 per cent., with an alkalinity of 5 per cent., obtained by the use of lime water. The following formula will give a mixture of that sort:

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[182] Rotch: "Pædiatrics," p. 141, 1901.

	OUNCES.
Milk	1½
Cream, obtained by skimming	2½
Water	19
Lime water	1
Milk sugar	1⅕

This makes 24 ounces of fluid. It is better to prepare sufficient to give an easily managed quantity rather than attempt to prepare a few bottles only with very small quantities. The mistake must not be made of beginning with too strong a formula. No difficulty will be experienced in increasing the strength of a milk mixture at any time.

Interruption of Lactation: Weaning.—The interruption of lactation and the substitution of artificial food for the mother's nourishment is a responsible matter, and one not to be undertaken without sufficient reason. Some believe that very few mothers cannot nurse the child if they are willing to do so. This is unquestionably true, and yet cases arise in which the indications for weaning are absolute. The best criterion as regards the child is its failure to gain in weight or its loss in weight. The infant should be weighed at regular intervals, from three days to one week, and a record kept of the weight. The average gain of the healthy nursing infant is at least ½ ounce daily. Many circumstances may cause the child's weight to remain unaltered for a short time. Should, however, the child lose in weight, it is evident that some condition is present which requires immediate attention.

Weaning may be indicated in the interests of the mother or child, or both. In the interests of the mother, other demands upon her strength may so tax her vitality that she cannot furnish proper nourishment to the child. Conditions disturbing the nervous system are most apt to disturb lactation. Physical exertion is well borne by nursing mothers, provided worry and mental distress are absent. When analysis shows that the mother's milk is deficient in nutritious substances and its quantity steadily fails, while the mother's nutrition is impaired by lactation, the mother is evidently unable to nurse the child. Septic infection of the mammary glands, nipples which cannot give exit to milk, or malformations of the breasts and nipples may render nursing impossible from the mother's standpoint. Unless, however, such physical condition is present that the milk cannot be obtained from the breast, weaning should not be undertaken, unless analysis proves that the milk is deficient in nutritious property and lacking in quantity.

From the standpoint of the child, weaning is indicated when the mother's milk does not agree with the infant. In some cases analysis will show that the milk is deficient in fat or proteid, while with other patients analysis reveals an excess of proteid and a high percentage of fat. A continued excess of proteid, after efforts have been made to correct the composition of the milk by attention to the mother's hygiene will produce continued indigestion in the infant, and is a valid reason for interrupting nursing. When the milk shows no considerable variation from the normal, the mother's hygiene can be so corrected that the condition of the milk will also be rectified. When, however, in spite of attention to diet, exercise, the condition of the blood, and general hygiene, the mother's milk persistently fails to nourish the child and to be well digested, nursing must be interrupted in the interests of the infant.

CHAPTER VIII.

INSANITY AND NERVOUS DISORDERS COMPLICATING THE PUERPERAL STATE.

Acute Mania.—One of the comparatively rare and very serious complications of the puerperal state is found in acute mania. This is seen in patients who have labored during pregnancy under great mental strain, either from the effect of illegitimate pregnancy or by reason of some overwhelming anxiety or sorrow. Patients who inherit mental and nervous disorders are naturally more prone to anxiety after gestation. Women who have been accustomed to the excessive use of stimulants or narcotics are likewise more apt to suffer from this disorder. In most cases infection of some sort is undoubtedly the cause of the difficulty. Septic infection not infrequently results in a condition of mental derangement. Toxæmia is very frequently present in these cases. Young and ill-developed women or women above the average age of childbearing are most susceptible to this affection. The character of labor does not seem to influence powerfully a patient in this regard. Cases develop after easy labor, while others are seen where the extraction of the child has been attended with difficulty.

Symptoms.—The symptoms of puerperal mania are mental aberration, usually of a melancholic and suicidal form. If infection be present, its presence is announced by variations in temperature. If puerperal sepsis complicates the case, the usual symptoms of that condition are at hand. When toxæmia is the exciting cause, deficient excretion, impaction of the intestines with feces, and the peculiar character of the pulse and temperature assist in diagnosis. The patient frequently becomes violent, attempting either the destruction of herself or of her child. She often refuses to nurse the infant, manifesting either apathy or marked aversion to it. She is usually enraged with her attendants, and often attempts personal violence. If the case be one of infection, the prognosis for recovery is bad, as a rule. If severe toxæmia exists, the issue is usually fatal. If but a mild form be present, appropriate treatment may result in cure.

Diagnosis.—It is of special interest in these cases to differentiate between puerperal septic infection and autoinfection or toxæmia. In the first the characteristic of inflammation, rise of temperature, is present, the temperature being lower in the morning than in the afternoon. The lochial discharge is or has been foul. Involution of the uterus is delayed. An exudate or swelling may be found in the pelvis. The patient may have diarrhœa or constipation. Thrombosis about the pelvis or pyæmic abscesses may develop. Embolic pneumonia may also occur. Treatment by sponging and packing, with free doses of alcoholic and forced feeding, gradually bring about an improvement.

In cases in which toxæmia is the exciting cause the patient's excretion has been deficient for some time. In some women the amount of urea and solids in the urine is markedly deficient. In others the urine is unaltered. The temperature in toxæmia may rise to considerable height at any time of the day or night. In severe and fatal cases the temperature does not drop, and does not alter a degree in several days. The temperature is high in proportion to the activity of the patient's mania. Examination of the genital tract finds no evidence of septic infection. The lochia is not foul, the uterus undergoes involution, there is no exudate or swelling in the pelvis, while pyæmic abscesses or pneumonia do not develop.

Treatment by local sponging, enforced feeding, accomplish nothing. The bowels are moved only by purgation, and in some cases impacted feces can be recognized by palpation. The patient refuses food in many cases. A catarrhal hypostatic pneumonia of both sides develops. The kidneys become affected by the constant effort to eliminate ptomaïnes, and the patient finally perishes from exhaustion or cerebral effusion, with a temperature of 108° or 109° F.

Treatment.—The treatment of this condition depends upon the recognition, if possible, of the exciting cause, and is symptomatic. When the case is one of hereditary insanity, isolation, life in the country, kind attendants, fresh air, good food and nursing, and at times seclusion from the child are all that can be done. Where the case is one of puerperal septic infection, this must be treated accordingly. Where toxæmia is present, vigorous elimination only will be of decided value. In employing sedatives in this case, codeia should be preferred to opium or morphine, because it less deranges excretion. Hydrate of chloral, if the patient be strong, is also beneficial.

Prognosis.—In cases in which the patient is of sound constitution and good powers of assimilation, and is young and in which mania has been caused by sudden and severe shock, the prognosis for recovery is good. Septic infection adds to the unfavorable element of the prognosis if it be present. In these cases treatment by isolation and by attention to the patient's nutrition is usually successful. In cases, however, where the patient is not young, where she inherits a highly nervous organization, with impaired nutrition and sluggish elimination, the prognosis is less favorable. Where there is a family history of insanity, the prognosis becomes distinctly unfavorable, as patients repeatedly pass into a condition of chronic insanity.

Neuralgia.—Patients are occasionally seen who suffer from obstinate neuralgia in the pelvic region after labor. This symptom should at once direct attention to the possibility of compression of nerve trunks by an inflammatory exudate in the pelvis. An examination should be made to determine the existence of such exudate, and, if such be found, the patient should be treated by saline purgation, rest in bed, counter-irritation, hot douches, and tonics addressed to the blood-making powers of the body.

In other cases no anatomical cause can be found for this disorder, and the patient must be treated for the anæmia which underlies the condition. Obstinate pain in one of the lower extremities, when accompanied by swelling of the leg, points to thrombus of the femoral vein as its most probable cause.

Hysteria.—Cases are occasionally seen in which hysteria in some of its many forms develops after childbirth. This commonly occurs in women of bad nutrition and who have been subject before labor to hysterical paroxysms. While the nervous condition itself is of little importance, it serves to indicate the fact that the patient is in a depressed and anæmic condition, and that she requires careful recuperative treatment. She should not nurse her child, or, at most, should be permitted to nurse it but partially, while every effort must be made to enable her to rise above the general depression which produces the special manifestation. Epilepsy and cholera may complicate the puerperal state in those who have been victims of these diseases before childbirth. These disorders reduce the strength of the mother, interfere with the successful nourishment of the child, and tend to prevent her return to a normal stage of convalescence. With the exception of removing the child from the breast, there is very little which can be done to influence these conditions. Treatment usually adopted for these cases is indicated, and the prognosis for improvement is not improved by reason of the existence of the puerperal state.

Functional Nervous Disorders.—Functional nervous disorders of all sorts are especially annoying in the lying-in period, as they interfere with the patient's recovery, and thus seriously affect her power of nourishing the child. Thus, headaches frequently recurring tend to depress seriously the mother's strength, and often bring about a failure in lactation. The mistaken belief has been current that childbirth tends to cure some of the maladies of the nervous system.

Quite the contrary, however, is true, for the additional strain upon the mother's strength tends to exaggerate rather than to cure preexisting neuroses. The susceptibility of the nervous system in lying-in women is a matter of common observation with physicians. But a very slight exciting cause is amply sufficient to bring about a great change in the patient's temperature, solely through nervous influence. Thus, anger or grief, fright, or rage may throw a puerperal patient into a fever, which will subside ofttimes within an hour from its beginning. When the disturbance is profound, a curious effect is produced upon the milk, which may become a serious matter for the child. Children have been made violently ill by nursing from a mother who was in a greatly perturbed condition. The exact alteration in the milk in these cases is not known, but the fact that some important change occurs is abundantly confirmed by observation. A similar condition is seen in animals, and it is well known that a milch cow may have her milk rendered unfit for use by being chased, harassed, or worried. This susceptibility of the nervous system should be remembered in caring for puerperal women, and all sources of irritation, as far as possible, should be removed from them.

Neurasthenia Following Labor.—Many puerperal patients are exceedingly sensitive to changes in temperature. Within a short time after delivery the cessation of muscular exertion in labor and the rapid cooling of the heated surfaces of the body cause a slight chill, which is a purely nervous phenomena and from which the patient rapidly recovers. Some women, however, who have had difficult labors are especially sensitive and susceptible to exposure to a very slight draught of air. This has probably had something to do with the popular fear lest a puerperal patient should catch cold. This condition is to be treated, however, not by depriving the patient of fresh air, but by clothing her suitably in woolen and by giving her an abundance of air, and, if the time of year permits, of sunshine as well. No greater mistake may be made than to reduce further the resisting power of such a case by keeping the patient in an ill-ventilated and overheated room. In patients who have been subjected to exhausting and prolonged labor, the functions of the special senses are slow in regaining their vigor; thus such patients are troubled with weak sight for some time after labor, while others may have disturbances of hearing, indicating a profoundly depressed nervous condition. Such functional disorders do not arise from structural changes in the nervous system, but are the result of the strain of pregnancy, culminating in the exhaustion of labor.

CHAPTER IX.

INTERCURRENT DISEASES COMPLICATING THE PUERPERAL STATE.

THE puerperal patient may become the victim of infections other than streptococcus or staphylococcus. Infections in the puerperal state greatly retard the patient's recovery by hindering involution, by interfering with lactation, by reducing the patient's powers of assimilation, and, in severe cases, by causing hemorrhage.

MALARIA.—A very conspicuous example of this is found in malarial poisoning, which often develops at the eighth or ninth day after childbirth, and has a most potent influence, not only in causing fever, but also in preventing the proper contraction of the uterus. The symptoms of this complication are the characteristic chill and fever, with sweating, in the absence of the signs of puerperal septic infection. The history will usually be elicited of malarial intoxication before or during pregnancy. The examination of the blood should make the diagnosis positive and furnish the appropriate indications for treatment.

This consists in the free use of quinine and arsenic, and also of iron and nux vomica. Quinine may be given to these patients in capsules in accordance with the following formula:

Sulphate of quinine	grs. 60.
Arsenious acid	gr. ½.
Scale pepsin	grs. 20.

In 20 capsules: two to be taken at once, followed by one every six hours.

After the first twenty-four hours this may alternate with the iron and nux vomica in the following combination:

Tartrate of iron and potassium	grs. 60.
Extract of nux vomica	grs. 3.
Sulphate of quinine	grs. 20.

In 20 capsules: one to be taken three times daily before eating.

Good food and stimulants are also indicated.

Diagnosis of the Infectious Disorders During the Puerperal State.—Considerable difficulty is sometimes experienced in diagnosticating the infectious disorders during the puerperal state. Puerperal septic infection must first be invariably considered and must be excluded. The Widal test will give information regarding enteric or typhoid infection, while the bacteriological examination of the blood will throw light upon other cases. The puerperal woman sometimes displays remarkable immunity to infections which attack one of her children. At other times measles, scarlatina, whooping-cough, and other infections of childhood are felt severely by the mother. As a rule, the puerperal woman is susceptible to all infection and contagion, and should be carefully guarded from it.

The media by which infections are conveyed to the puerperal woman are contact with hands, instruments, clothing or dressings, infected water used in douches or in bathing the genital organs or in drinking, and infected air. Tetanus may be conveyed by water containing the

Fig. 159.

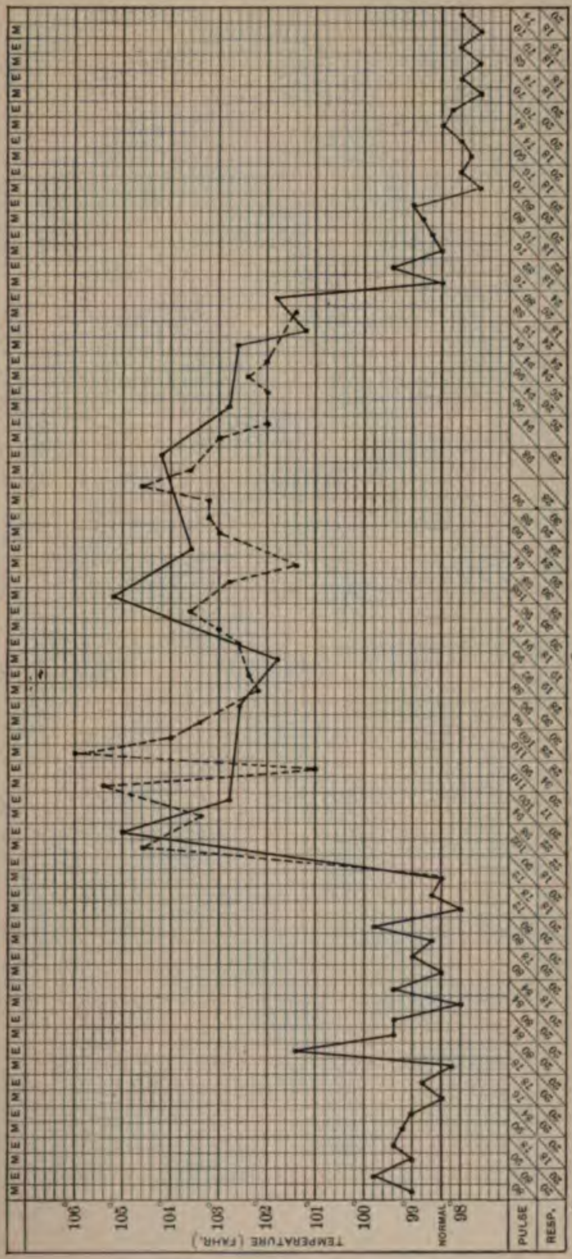


Chart.—Malarial infection complicating the puerperal state.

germ of the disease and diphtheria, tuberculosis, and mixed infection from the throat may be conveyed by contact with sputum or by objects which have touched the mouth or lips. If an infection has been present in the body before labor, it may develop with renewed activity after the birth of the child; thus, in some patients who are tubercular pregnancy acts as a stimulus to nutrition, and the patient

FIG. 160.

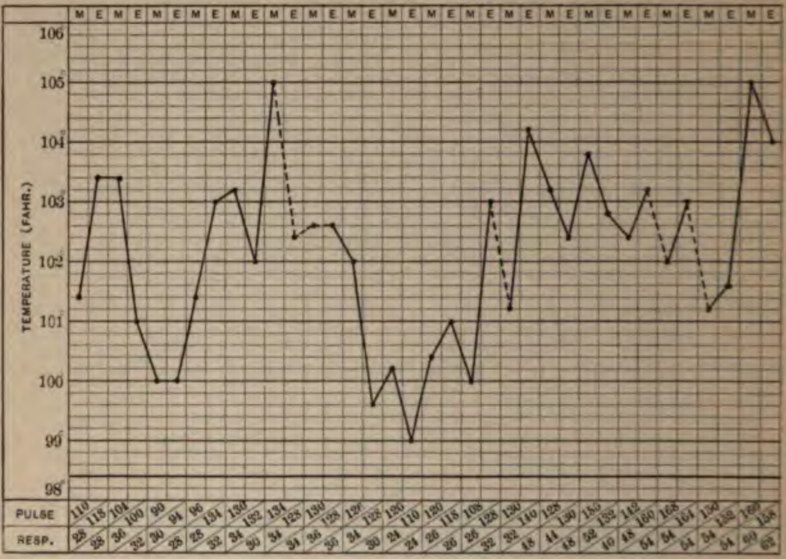


Chart.—Spontaneous labor, mother and child uninjured. Patient an immigrant woman sent to hospital from steamer. Death from severe chronic malarial intoxication.

FIG. 161.

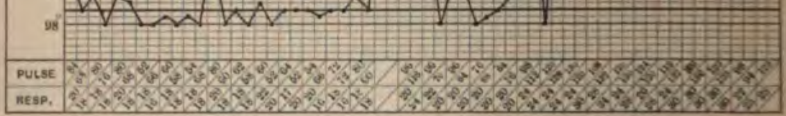


Chart.—Enteric typhoid infection developing during the puerperal state. Patient transferred to the medical wards of Jefferson Hospital.

is somewhat improved before labor. After labor, however, tubercular infection spreads with increased rapidity to a rapidly fatal issue.

Treatment.—The treatment of the infections which attack the puerperal patient is that indicated in the non-puerperal. Antipyretic drugs should, under all circumstances, be avoided, as they depress the patient and tend to favor the occurrence of hemorrhage. Should severe hemorrhage occur, if the patient's general condition permits, strychnia and ergot may be given, and, if necessary, the uterus may be tamponed with sterile gauze. If hemorrhage in these cases results largely from disorganization of the blood, it may be exceedingly difficult to control.

Fig. 162.

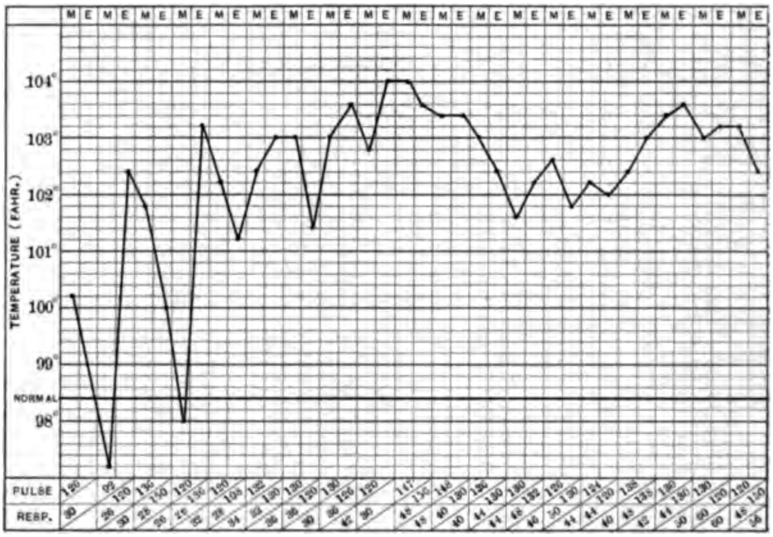


Chart.—Fatal tubercular pneumonia, complicating the puerperal state.

Non-Septic Fever.—The nervous system during the puerperal state is so sensitive that a slight disturbance may produce fever. Thus, in the experience of the writer a puerperal patient in normal condition was moved from one bed to another in a maternity hospital. One of the stretcher bearers made a misstep, stumbled, and jolted the patient. She was in no danger of falling and received no injury. Her temperature immediately rose to 104.5 F., and steadily fell to normal without medication. Grief, fright, anger, fear, and any depressing emotion may result in fever in a puerperal patient. Cases are occasionally seen in which the temperature remains slightly elevated without assignable cause. These patients often improve when they advance sufficiently to leave their beds and to assume an erect or sitting posture. In other cases fever during the puerperal state is caused by toxæmia of fecal origin.

Fecal Toxæmia.—In highly neurotic patients, in whom the intestine has always performed its functions imperfectly, and who have neglected the complete emptying of the bowels, labor may be followed by paresis of the nerves promoting peristalsis and by dilatation of the intestine with impaction of feces. In these cases the temperature rises to 101 or 102 F.; the pulse becomes exceedingly rapid; the

FIG. 163.

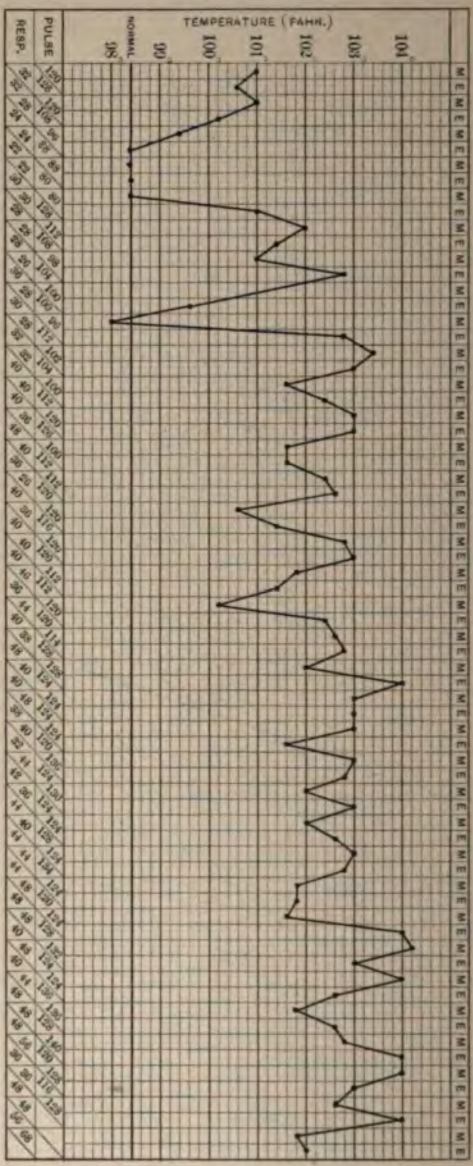
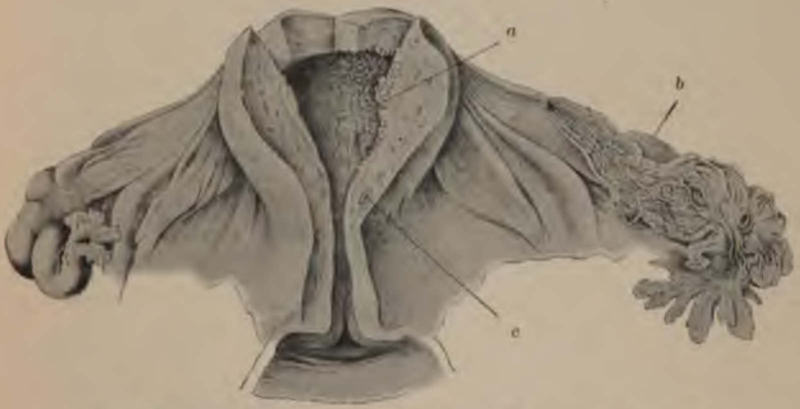


Chart.—Fatal pulmonary tuberculosis complicating the puerperal state.

abdomen is greatly distended; there is tenderness on deep pressure and dulness on percussion over the fecal mass, which is usually found upon the patient's left side, in the left hypochondrium. The patient may vomit, and her condition may become alarming. In these cases puerperal septic infection and peritonitis must first be excluded. The localization of the impacted feces, the fact that tenderness is limited to this point and is less pronounced than in septic cases, and the general condition of the patient, which is much less grave than in septic cases, assist in the diagnosis.

Treatment.—The treatment of this condition consists in emptying the bowels as thoroughly as possible. Compound cathartic pills may be given in powder form if they are vomited in pill form. Small doses of calomel, followed by very small doses of salines, may be administered. Strychnia or nux vomica and belladonna may be given to promote peristalsis and improve the tone of the intestine. The patient must be nourished in the manner best available by peptonized milk, broths, or gruels administered by the mouth or by the rectum. An especially important method of treatment in these cases consists in the emptying of the intestine by high enemata or by irrigation. Enemata containing ox-gall are especially valuable. These should be given as high as possible with the patient turned upon the left side and the hips raised. They may be followed after a few hours by copious enemata of soapsuds, castor oil, and turpentine, and later by a saline purgative enema containing magnesium sulphate, glycerine, and turpentine. If the rectum is utilized for feeding, care must be taken to irrigate the bowel once daily with sterile water or normal salt solution, and to boil thoroughly all tubes and utensils employed in rectal feeding.

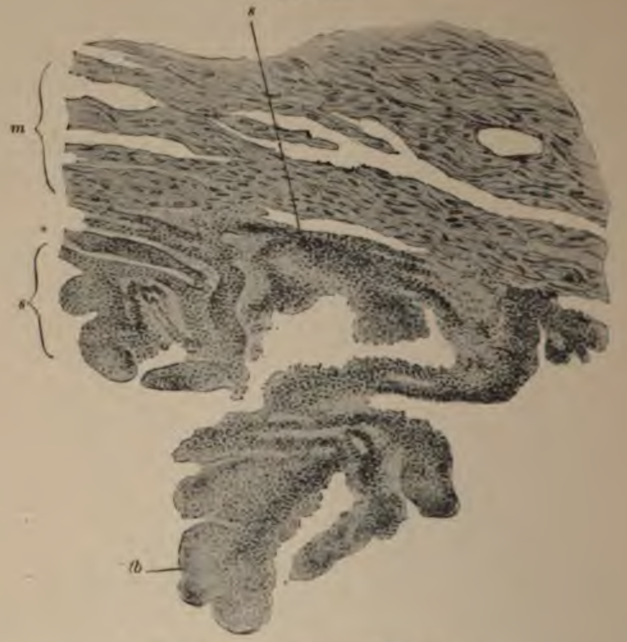
FIG. 164.



Tubercle of genital tract; abortion at five months; death. (HÜNERMANN.)
a. Placental site. b. Left ovary. c. Vessel with thrombus and tubercle-bacilli.

Prognosis.—The prognosis, so far as recovery is concerned, in these

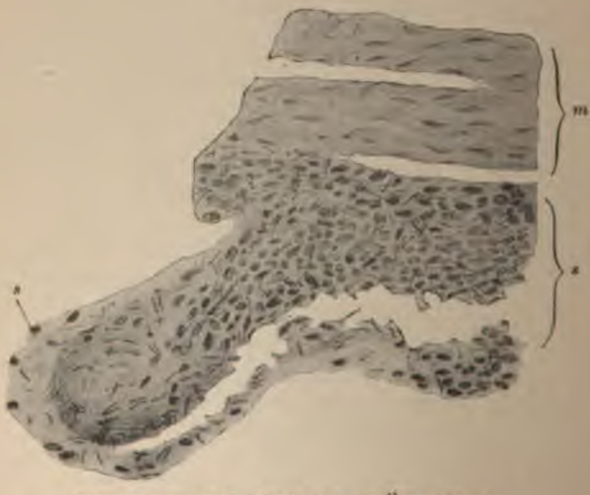
FIG. 165.



Section of left tube. (HÜNERMANN.)

m. Muscular tissue. s. Mucous membrane infiltrated with tubercle. tb. Tuberculous tissue beginning to break down.

FIG. 166.



Mucous membrane of left tube. (HÜNERMANN.)

m. Muscular tissue. s. Mucosa, with tubercle-bacilli.

cases is usually good. In some, bacteria penetrate the wall of the bowel, entering the lymphatics and setting up a lymphangitis and peritonitis, producing obstruction which cannot be relieved. The bacillus coli communis may infect the general peritoneal sac, causing a fatal issue. When the temperature remains comparatively low, distention diminishes, tenderness is not excessive, and the patient retains nourishment, the prognosis is good. When signs of infection of the peritoneum develop, the prognosis becomes exceedingly grave.

FIG. 167.

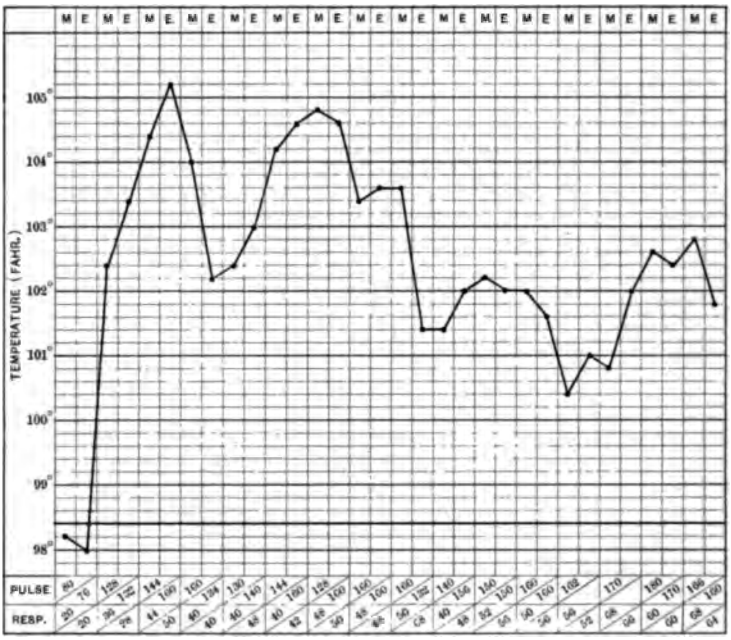


Chart.—Twin pregnancy, dropsy, distention of bladder and bowels; polyhydramnios, spontaneous labor, fœtal dropsy and maldevelopment. Mother and child perished from exhaustion.

Constipation.—Some patients become obstinately constipated during the puerperal state. In many cases constipation existed before labor. In other cases it develops after the birth of the child.

In these cases treatment should be addressed to the individual needs of the patient. It is necessary first to thoroughly unload the bowels, and this must be accomplished by compound cathartic pills, calomel, and salts, or compound licorice powder. Saline purgative enemata must also be used. After the intestine has been emptied fluid extract of cascara may be used, at first in large doses until the intestine acts freely. Then the dose may be diminished until, upon resuming her usual duties, the patient is able to go without medicine. Massage is especially valuable in these cases, and in some patients the interrupted electric current may also be employed. The diet should be carefully regulated, and mild saline waters may be used to advantage.

Hemorrhoids.—During the later months of pregnancy hemorrhoids frequently develop, and may occasion much annoyance. In the puerperal state they commonly manifest themselves on the second or third day after labor, and may be forced down by the movement of the bowels, which usually occurs at that time. External hemorrhoids may persist for some time after labor and occasion much annoyance.

In treating this condition the intestine must first be thoroughly emptied, and the liver of the patient stimulated to act efficiently. Aloes is often useful in this condition, and may be given in the following combination:

FIG. 168.

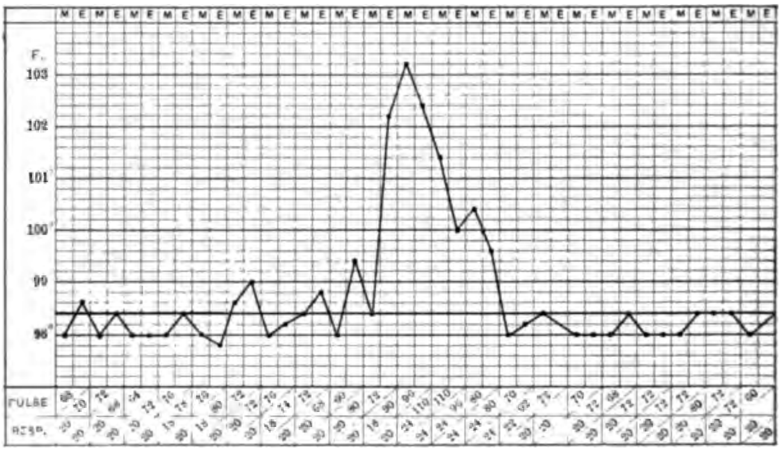


Chart.—Spontaneous labor, mother and child uninjured, constipation complicating puerperal state.

Purified aloes	gr. 5.
Extract nux vomica	gr. 1.
Extract belladonna	gr. 1.

In 10 pills: one night and morning.

Locally, equal parts of ointment of stramonium and ointment of gallic acid will be found useful. Extract of hamamelis is useful in some cases, and 25 per cent. ichthyol ointment, combined with belladonna ointment, lanolin, and vaseline, is also useful. Some patients are greatly benefited by fomentations, and others obtain much comfort from the local use of ice. Occasionally it is necessary to split a hemorrhoid, turning out the clot and disinfecting its cavity with carbolic acid or iodoform. Radical operation is rarely indicated, as in many cases the trouble ceases spontaneously and the condition of the pelvic veins immediately after labor is not favorable for any operation.

Insomnia.—Puerperal patients occasionally suffer greatly from inability to sleep. Sometimes it is a restless infant which disturbs the mother's slumber, but with other patients it is a profoundly depressed condition of the mother's general strength, with great nervous exhaustion. In the treatment of these patients all causes of irritation must first be removed. The child must be kept at night in a room so far from the mother that she will not hear its cry. Appropriate hypnotics may be prescribed, but in moderate doses only. Care should be taken to regulate the patient's digestion and to feed her abundantly, and she should take milk or other appropriate food at least once during the night. In warm weather a sponge bath at evening may be beneficial, while other patients do well with massage given during the afternoon. Occasionally the patient seems roused by bathing or massage and is more sleepless than before. A change of air and scene is especially valuable in these cases.

After-pains.—The term "after-pains" is applied to intermittent pains in the uterus occurring after labor. These are sometimes rhythmical, and resemble the pains of parturition. They may be accompanied by contractions of the womb, or uterine contraction may not be plainly discerned. They often seem to be excited by nursing the child, and in some cases by a change in the weather, especially to cold and damp weather, or by any source of nervous irritation.

In the great majority of cases a clot or portion of the placenta or membranes retained after labor causes after-pains. Of these, the most frequent is a clot which increases slowly for several days, finally irritating the womb sufficiently to secure its expulsion. Cases of neuralgia of the uterus or excessive sensitiveness of the womb after labor are exceedingly rare.

Treatment.—If the uterus is not allowed to bleed during and after the third stage of labor, after-pains will be very rare. The better the uterus contracts after labor the less apt is the patient to have after-pains. Strychnia and ergot, in our experience, do not increase but greatly lessen the occurrence of after-pains. In cases where the uterus has been tamponed with iodoform gauze at the conclusion of labor, after-pains are uncommon.

In the presence of this complication the operator must decide whether the condition is sufficiently grave to warrant interference with the uterus. Should the condition of the pulse and other phenomena point to the occurrence of hemorrhage, then the clot which causes the after-pains must be removed from the uterus, the uterus packed with gauze, and stimulants given freely. If, however, the pulse is good and the uterus is not large and well contracted, the uterus may be left to expel the clot unaided. Good uterine contractions should be maintained by tonic doses of strychnia and ergot. For the relief of pain, a hot turpentine stupe over the abdomen will usually be sufficient. The stupe may be lukewarm or even cool if desired. To calm the nervous system, bromides may be given, and if these fail, codeia or morphia. Viburnum prunifolium has some value under these conditions. In these cases the clot will usually be expelled, and after-pains will gradually disappear.

In cases where after-pains are seen in highly anæmic and neurotic women, they will not cease until the general strength of the patient is so improved that the nervous system resumes its normal condition. Such cases require food, tonics, massage, and all the agencies which can bring about good general health. Only the mildest sedatives should be employed in these cases.

PART IV.

OBSTETRIC SURGERY.

OBSTETRIC OPERATIONS.

OBSTETRIC operations are undertaken to save the lives of mother and child or to prevent dangerous suffering and exhaustion. No medical man has so great a responsibility as the obstetrician. The surgeon or physician finds ample employment for his faculties in the care of one life only in a given case. With the obstetrician two lives are at stake—one the mother's, with a definite and fixed value to the community, and the other the child's, with great potential value. As parturition usually happens at indefinite times, the operator cannot usually appoint the time for an operation, but must perform it when the interests of the patient demand. Many of these patients cannot, or will not, go to hospitals, and hence the operation must be performed in a private house. For these reasons obstetric operations are especially difficult and responsible. Good judgment and skill are necessary for their performance, while the best of nurses and assistants are required. The fact that they are difficult and responsible has led many physicians to avoid them, and lives are not infrequently lost and health ruined because a necessary obstetric operation is omitted or is improperly done.

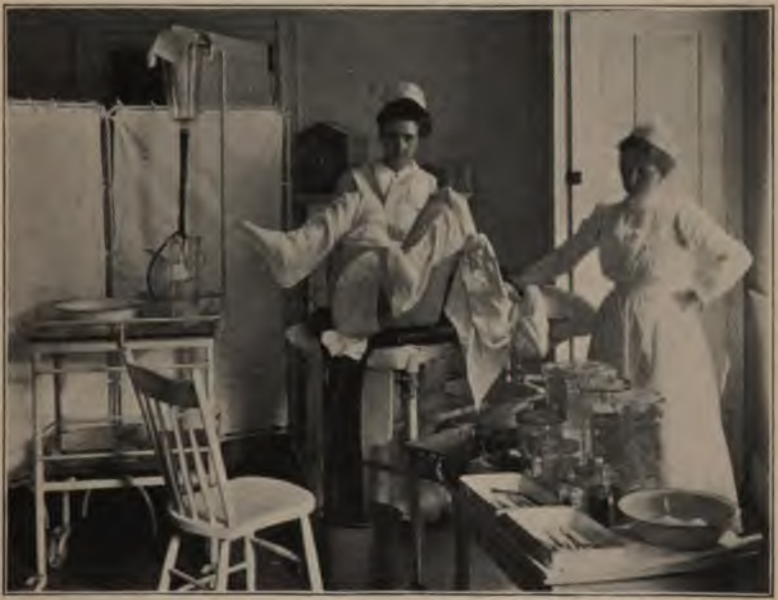
In undertaking such operations a clear understanding with the friends of the patient is necessary. When a woman suffers long in labor, she will usually consent to any reasonable procedure which promises relief from pain and the life of the child. The husband or relatives of the patient may not agree to such operation, and the physician may be wrongfully criticised if he operates without consent. While it is not kind to explain the details of such operations to the patient, the husband or nearest responsible relative should be privately informed of the nature of the operation demanded, the reasons for its performance, and the probable risk to mother and child. The consent of this person should be obtained. It is due to patients and to the profession that the difficulty and responsibility of obstetric operations should be thoroughly impressed upon the minds of the laity. Cases of labor will then receive better attention, and more adequate remuneration will be given to physicians who accept them.

Instruments and Apparatus.—For abdominal section and for closing lacerations, instruments suitable for general surgical practise are appropriate. For deep laceration of the perineum and pelvic floor, large, fully-curved needles may be required. For operations peculiar to obstetrics, the obstetric forceps, instruments for embryotomy, the obstetric douching curette, forceps suitable for tamponing the uterus, instruments for dilating the cervix, and suitable specula are needed. For suture material in the pelvic floor, chromicized catgut, so prepared as to remain unaltered for ten days or two weeks, is necessary. For abdominal operations, sterile catgut, medium and fine; good pedicle silk, and fine silk and silkworm gut are needed. A large rubber pad for drainage at operations is also required. For abdominal operations a suitable table, with Trendelenburg attachment, is necessary. For vaginal operations, a firm, solid table of convenient height is required. Apparatus for saline transfusion, the battery giving a faradic current, and in hospitals apparatus for using oxygen are also valuable.

Apparatus for Securing Sterilization.—The sterilization of dressings may be done in a hospital or at the home of the physician by any form of sterilizer preferred. In the absence of special apparatus, dressings may be boiled in a clean wash boiler, soaked in bichloride of mercury solution, dried, and wrapped in sterile towels and covered with waxed paper. Sterile sheets and towels are also needed, and sterile gowns for the obstetrician and for assistants and nurses. Instruments may be prepared by sterilizing them in trays at the physician's office or hospital, and carrying these trays unopened to the house of the patient. Another method which, in our experience, has advantages consists in sterilizing instruments at the patient's house when they are needed. We have had satisfaction in using a metal box sufficiently large to contain forceps and craniotomy instruments, having a cover which fits completely over the box. Such a box may be packed with forceps and other instruments necessary to conduct an ordinary labor or forceps delivery. Forceps for packing gauze, instruments for closing lacerations, needles for transfusion or hypodermoclysis, ligatures for the cord, silkworm gut, and chromicized catgut for closing lacerations, and rubber gloves may be conveniently packed in such a box. When the second stage of labor is drawing to its close, sufficient 1 per cent. lysol to cover these instruments is poured into the box, and the instruments are boiled in this solution. When they are needed, the box is opened and the upper half or cover provides an empty sterile tray, into which a portion of the instruments may be conveniently placed. Lysol is sufficiently lubricating to render the use of other non-sterile lubricants unnecessary. The instruments are taken immediately from the solution for use. When the operation is finished, the instruments are again boiled in lysol, carefully dried with clean towels, and the box is repacked. In our experience, instruments keep well by this method, rust does not develop, and sterilization is satisfactorily accomplished. For boiling, alcohol lamps may be taken, with a support for the box, and thus the operator is independent of a source of heat in the patient's house. The size and weight of such an outfit is not excessive, and this plan has the merit that in complicated and long-continued cases, where more than one obstetrical procedure may be necessary, instruments can be sterilized as frequently as desired.

The outfit necessary for a spontaneous birth, forceps or version, or dilating the cervix, or curetting the puerperal uterus, may readily be carried in a cabin bag of medium size. To this should be added strips of gauze in sealed jars for tamponing, elastic bags for dilatation, stimulant drugs, a small quantity of brandy, several pairs of rubber gloves, and a sterile gown. We have found it advantageous to provide suitable sterile linen for covering the patient's lower extremities and the abdominal surface. We have had made such a combination known by our nurses as a forceps sheet. This has two legs sufficiently large to go over the patient's stockings and over the thighs and a broad upper piece which covers the abdomen. This is sterilized, folded closely, and pinned in a sterile towel. For supporting the patient's limbs a clean sheet, folded in the longest way, is all that is needed. This may be passed beneath the patient's neck, over the shoulders, the limbs extremely flexed, and the ends of the sheet tied about the leg on the outer side, just beneath the knee. By

FIG. 169.



Patient in position, limbs supported by sheet and covered with sterile linen for forceps operation. (From original photograph.)

such application the patient's limbs are flexed and rotated slightly outward.

Supplies Furnished by the Patient.—Some of the articles needed in obstetric operations should be in readiness at the patient's house. A glass catheter, a soft rubber catheter, lysol or creolin, tablets of bichloride of mercury, ergot for hypodermatic use, tablets of strychnia, an alcoholic stimulant, and an abundant supply of sterile sheets and towels, with sterile nail-brushes, should be obtained by the patient's nurse and kept in readiness.

In private houses an operating table may be carried by the operator or one may be improvised by taking a kitchen or other broad and firm table, covering it with blankets and clean sheets, and placing upon it a rubber inflated pad. Several small tables or stands are needed, which should be covered with sheets or towels sterilized or wrung out of bichloride of mercury, 1 : 2,000. A competent nurse will cover the floor beneath the table with some material which will prevent injury to the floor or carpet. An experienced physician and nurse will so conduct an obstetric operation in a private house that the patient's furniture and floors shall not be damaged, and that every essential for a successful operation shall be secured. It is well to perform the operation in a room adjoining the one used by the patient. A good light should be selected, unnecessary furniture and articles removed if possible, and a suitable temperature procured. In cases where rugs are used, they should be removed if possible; and where carpets are nailed to the floor, the carpet must be covered about the operating table to prevent infective dust from gaining access to the genital tract. The patient may then be anæsthetized in her bed, carried to the operating table, and suitably prepared. Hot-water bags should be in readiness, and the patient's bed should be clean and dry for her reception after the operation.

Preparation for Obstetric Operations.—For delivery through the vagina, the patient should be prepared by shaving or closely clipping the hair from the external genital organs. She should be catheterized and the rectum emptied by enema. The parts should be thoroughly scrubbed with green soap or tincture of green soap, rinsed with boiled water, rubbed with bichloride of mercury solution, 1 : 2,000, and again rinsed with boiled water. The physician must determine whether he will trust the nurse to cleanse the vagina or whether he prefers to do this himself, or will allow the vagina to remain undisturbed. It is usually safest for the physician, when the patient is completely anæsthetized, to have her placed in position, the limbs supported by the sheet, and the limbs and abdomen covered by the sterile operation sheet. Having sterilized his hands and put on rubber gloves, he should then catheterize the patient again, and should then thoroughly cleanse the vagina with tincture of green soap and pledgets of sterile gauze or cotton, followed by a copious douche of creolin or lysol, 1 per cent. By this method the epithelia of the vagina is injured less than if a mercury solution be used for cleansing.

In cases of abdominal delivery, the patient's abdomen should be prepared as soon as possible by shaving the pubic region, by scrubbing with green soap, hot water, and nail-brush, then with boiled water, then with bichloride of mercury solution, 1 : 2,000; then with boiled water, and then with alcohol. If the operation is not to be performed immediately, a moist dressing of bichloride of mercury gauze, 1 : 2,000, may be applied over the abdomen. When the patient is anæsthetized for operation, after she has been catheterized, the abdomen should be again prepared by an assistant in the manner already described. If time permits, it is well to cleanse the vagina before delivery by abdominal section. When it is evident that an obstetric operation may be necessary, care should be taken to give the patient only such food as will leave no residue in the stomach. Broths, soups, raw eggs beaten up with a little wine should be employed. If milk is used, it should be peptonized.

Preparation of the Operator.—The obstetrician should, so far as he can, avoid contagious and infectious cases. Under no circumstances should he make or attend autopsies, nor should he attend cases of severe infectious diseases. In all suspected cases, of whatever nature, where vaginal examination, or any operation, is necessary, he should protect his hands by rubber gloves. Especial attention to the hands is required in the interests of the patient and the physician as well. The nails must be trimmed short and smoothly, hang-nails carefully avoided or removed, abrasions and cuts healed as promptly as possible, and the skin kept as sound as possible. The constant use of the nail-brush for toilet purposes is necessary. Personal cleanliness does much to remove possible sources of infection to the hands. In cases where the uterus or abdomen are entered by the hand, it should be covered by sterile rubber gloves. Gloves may be used in all cases if the physician desires. It is possible to deliver without gloves spontaneous parturition and to perform forceps extraction when the head is upon the pelvic floor without danger to the patient if the hands be sound and made thoroughly antiseptic.

To clean the hands, three reliable methods are at our disposal:

First, thorough and vigorous scrubbing with solid green soap and hot water, or with tincture of green soap and hot water, with a good nail-brush for ten minutes. The nails should be cleansed with some smooth object, as a stick of orange wood or ivory cleaner. In this way the under surface of the nail is not roughened, and foreign material does not adhere to the nail. The hands should then be thoroughly scrubbed with hot boiled water until the soap has been entirely removed. While the hands are still wet, they should again be scrubbed with bichloride of mercury solution, 1 : 1,000. This cleaning should include the entire forearm, with the elbows. Vigorous scrubbing with alcohol may complete the cleansing. To lubricate the hand for a vaginal examination, a basin of boiled solution of lysol or creolin, 1 or 2 per cent., may be used. Biniodide of mercury in glycerine, 10 per cent., is also useful, and agrees well with some persons whose skin is delicate.

The second method of cleansing the hands is that practised and stated by Keen as follows: "Scrub thoroughly with hot water and green soap, cleaning about and beneath the nails. A scant tablespoonful of commercial chloride of lime is put in the palm, and a piece of sodium carbonate 1 inch wide and 1½ inches thick. A little water is added to make a thick cream. This is rubbed into the palms, hands, and arms until it is perfectly smooth and there is a sense of coolness in the palms. It should be well rubbed under and around the nails. From three to five minutes are necessary for this. The hands are then washed with sterile water. If any odor persists, it may be removed by a dilute solution of ammonia water. The hands should be rinsed and scrubbed in bichloride, 1 : 1,000."

The third method is that of Schatz, which is as follows: The hands and forearms are vigorously scrubbed with a good nail-brush, with brown kitchen soap or green soap and hot water for ten minutes. The nails must be cut short, and the spaces between the fingers and the nails must receive especial attention. The water should be changed several times in which this scrubbing is done. From ten to fifteen minutes are requisite for this scrubbing. The hands and forearms are next immersed in a hot saturated solution of potassium permanganate until stained a deep mahogany color. They are then immediately transferred to a saturated solution of oxalic acid as warm as it can be conveniently borne. This decolorizes and sterilizes them. The oxalic acid can be removed by rinsing the hands in warm water or in sterilized lime water, which at once neutralizes the acid. Should the hands or arms come in contact with objects not sterile, vigorous scrubbing for ten or fifteen seconds with a fresh brush is necessary.

Should the operator's hands come in contact with non-sterile objects, they must be immediately sterilized again.

The irritation to the skin produced by frequent preparation of the hands may be lessened by making as few vaginal examinations as possible and by the use of gloves, which may be washed and soaked in bichloride solution without removing them from the hands and without disturbing the skin of the hands. Sterile glycerine may be used as a lubricant for the hands before putting on the gloves in cases where great irritation of the skin is present.

The operator should cover his clothing with a gown of sterile material. This should be sufficiently large to thoroughly cover the operator. The nurse who has charge of his instruments, sutures, and ligatures should also wear a gown or should have sterilized sheets pinned over the clothing. Assistants and other nurses should be similarly clothed.

The Anæsthetizer.—A competent anæsthetizer should be at hand for each obstetric operation. If possible, one who has had obstetric experience should be procured, because it may be necessary to obtain his assistance in manipulating the uterus through the abdominal wall. It is necessary to vary the degree of anæsthesia in some obstetric operations in accordance with the various steps of the operation. Thus, deeper anæsthesia is required in version than for the use of forceps. It is often necessary to allow anæsthesia to partially cease to rouse the expulsive forces of the uterus.

The anæsthetizer should have at his disposal suitable apparatus for giving ether or chloroform. He should have instruments for opening the mouth, grasping the tongue, hypodermic syringes in good order, and drugs for stimulating respiration and the action of the heart. While ether may be employed in a large number of cases, chloroform is best in some, and the anæsthetizer should be competent to give either anæsthetic. Anæsthesia for obstetric operations should not be entrusted to unskilled persons or to those who are without experience in this work.

Nurses for Obstetric Operations.—Nurses especially skilled in obstetric work are necessary for the care of patients during and after obstetric operations. A thorough drill in asepsis and antisepsis is absolutely demanded for these cases. The ordinary course in obstetric instruction given to nurses, in which the nurse sees a small number of normal cases, is not sufficient for operative work in obstetrics. Wherever possible, the services of one nurse who has had experience in obstetric operations should be obtained for the operation itself. Such a nurse should look after the sterilization of instruments and dressings and the preparation of the patient. Those who do much obstetric work will find it advantageous to take with them to obstetric operations a nurse who is accustomed to work with them, and who is thoroughly trained.

Results of Obstetric Operations.—When compared with other surgical procedures, obstetric operations selected with good judgment and performed under antiseptic precautions, with reasonable skill, give excellent results. When done in a slipshod and careless manner, they result in high mortality for mothers and children.

Operative Work in Maternity Hospitals.—It is obvious that obstetric operations can be done with greater safety in maternity hospitals than in the houses of patients. Each well-equipped maternity has an operating room adapted for such purposes, in which asepsis and antisepsis can be efficiently carried out. All appliances for resuscitation and stimulation are in readiness in such a room, and the clinic nurse and assistants are available; hence in cases which promise complications, or which develop abnormalities, patients should be taken to maternity hospitals if possible. Even those of ample means realize the increased advantages to be obtained at such a place and the great convenience which the transference of such a patient to a hospital gives to a private family.

When a patient cannot be taken to a hospital, then a hospital must be improvised in the house of the patient.

The Presence of Friends or Relatives at Obstetric Operations.—In some instances the husband or nearest responsible relative of a patient requests permission to remain with her during the operation.

In obstetric cases this request may often be granted to advantage. A relative who witnesses obstetric operations properly performed is often impressed with the antiseptic precautions observed, and sometimes the difficulty of the operation. So many persons consider parturition a simple affair in all cases, not distinguishing between the normal and abnormal, that it is well, in the interests of patients and the profession, for a proper appreciation of the difficulties and responsibilities of obstetric surgery to become widespread.

SECTION I.

THE SURGERY OF PREGNANCY.

CHAPTER I.

ABORTION.

In treating of inevitable abortion we have already described those methods best adapted for controlling hemorrhage and for causing the discharge of the ovum. Where hemorrhage is present, abortion can usually be most safely terminated by tamponing the cervix with iodoform gauze. This should be accompanied by a vaginal tampon of dry bichloride gauze. The administration of strychnia and ergot in tonic doses causes the uterus to contract, while the pressure of the gauze controls hemorrhage, dilates the cervix, and secures the expulsion of the uterine contents.

Abortion should not be induced by the introduction of foreign bodies within the womb. This is the method of the criminal abortionist, a method as objectionable from a scientific standpoint as it is from the moral side. The membranes are not sufficiently developed in early pregnancy to permit the introduction of a foreign body without wounding the uterus itself and without opening its lymphatics and bloodvessels. Gauze packing is safe and efficient in cases where it is unnecessary to empty the uterus as soon as possible.

Where hemorrhage has not occurred and the patient is in such a condition that she cannot retain food and stimulus, or where septic infection has developed, therapeutic abortion must be conducted as a surgical procedure. Under appropriate anæsthesia, the cervix must be dilated by solid dilators and the contents of the uterus removed with the curette. Gauze packing, for drainage and to secure an antiseptic condition of the uterine cavity, should follow.

The production of abortion is justifiable only in cases where therapeutic abortion is indicated. In cases where pregnancy must be interrupted in the interests of the mother, it is most unsatisfactory to depend upon the action of drugs. The methods described have borne the test of experience, and are advised in such cases.

CHAPTER II.

THE INDUCTION OF LABOR.

It is sometimes necessary to interrupt pregnancy and terminate gestation. If this be done before the fœtus is viable, it is known as therapeutic abortion. After the period of viability it is termed induced labor.

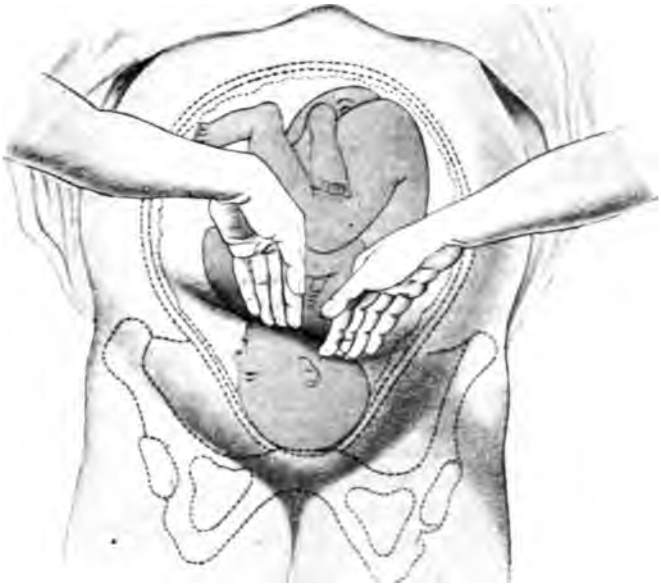
The reason for inducing labor is danger to the life of the mother or to that of the child. Where pregnancy is complicated by abnormalities which threaten the mother's life, and where the termination of pregnancy would give ground for hope that she might recover, gestation must be ended. In other cases it is found that some complication exists in the mother which will render the birth of her child at term impossible. Gestation must be terminated at a selected time in these cases in the interests of mother and child.

Cases of contracted pelves in which labor is induced are examples of this latter class. The interruption of pregnancy at any time is a matter of serious importance, and the physician must be sure of his ground before having recourse to such a step.

Indications.—Labor is induced in contracted pelves whose antero-posterior diameter internally is 8½ cm. (3½ inches) or more, when the head can be brought to engage by manipulation, if needed, under anæsthesia. If the internal antero-posterior diameter of the pelvic brim is less than 8½ cm., the induction of labor must be declined. Should it become necessary to empty the uterus in the interests of the mother, the case is practically one of therapeutic abortion. In cases where an effort is made to obtain a viable child, labor is usually induced between the thirty-second and thirty-fourth week. In the great majority of cases this time has been chosen because the child has reached a good development, while the bones of the cranium are not so firm and resisting as they later become. Labor should also be brought on in cases of toxæmia which do not yield to treatment, in severe cases of insanity and where heart disease or rapid phthisis threatens the life of the mother. In the interests of the fœtus, labor should be induced in cases in which during previous pregnancies the fœtus has perished at a certain period of gestation. Cases in which polyhydramnios has developed late in pregnancy, or in which, from unknown causes, the life of the fœtus has been lost, belong under this category. In patients in whom there is a history of excessive size in the fœtus, with difficult labor and fœtal death, labor may be induced in the interests of the child as well as the mother.

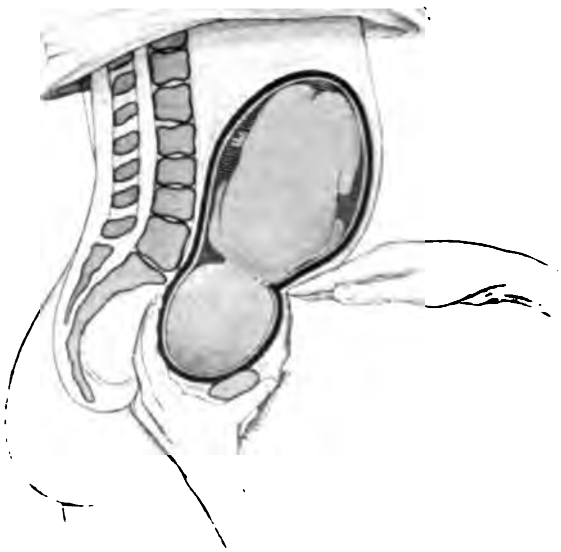
Prognosis.—Induced labor is more dangerous than normal birth to both mother and child. The dangers for the child, however, if antiseptic precautions are taken, are far greater than are those of the

FIG. 170.



Determining the engagement of the head. (BEUTTNER.)

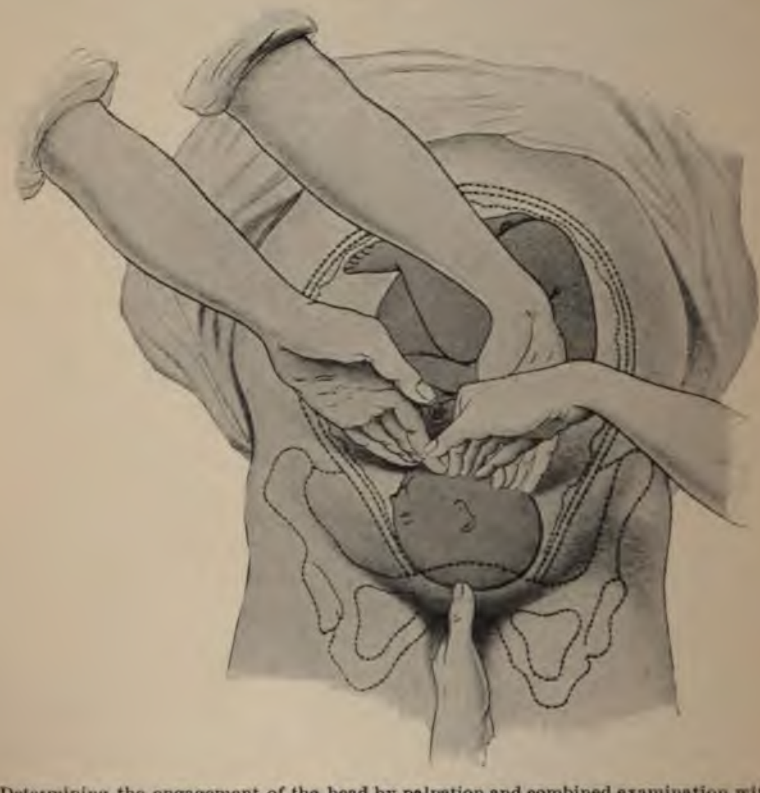
FIG. 171.



Determining the engagement of the head by palpation and combined examination. (BEUTTNER) mother. In the hands of those practising antiseptic operations the induction of labor has no direct mortality rate for the mother. The practise of incubation and additional knowledge in infant feeding have very greatly reduced fœtal mortality following induced labor.

The dangers to the fœtus are variously stated by different observers. A fœtal mortality of 10 per cent. in induced labor is not an excessive estimate of the dangers of this procedure for the child. Fœtal mortality and morbidity arise in these cases largely through the pressure of the unelastic cervix upon the child. In some cases separation of the placenta, with hemorrhage and fœtal asphyxia, follow the introduction of a bougie to bring on labor.

Fig. 172.



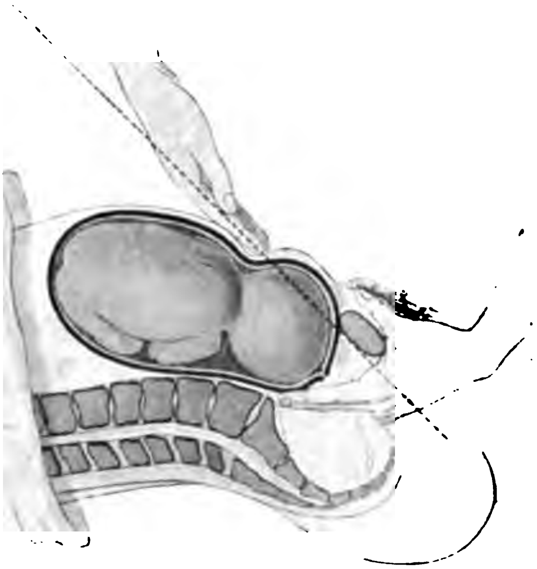
Determining the engagement of the head by palpation and combined examination with the aid of an assistant. (Beuttner.)

Preparation.—To prepare for this operation, the same care should be exercised which is employed before abdominal section. The patient should be kept in bed for several days, the bowels thoroughly moved, the skin repeatedly cleansed with soap and water and with ammonia or alcohol and water.

The hair should be shaved from the genital organs; the external parts should be thoroughly cleansed with tincture of green soap and water, then with boiled water, and then with bichloride of mercury, 1 : 2,000. The vagina should be cleansed with tincture of green soap and boiled water, irrigated with sterile water, and then with 1 per cent. solution of lysol or creolin. Precautions should be taken to secure the cleanest possible surroundings for the case. The usual antiseptic dressings and appliances for the sterilization of instruments should be at hand. In women suffering from toxæmia, in addition to thorough purging, milk diet is best for several days, with repeated hot packs to secure elimination.

Special care must be taken with everything which touches the patient that it be thoroughly aseptic.

FIG. 173.



Carrying the head into the pelvic brim by palpation and combined examination.
(BEUTTNER.)

Methods.—Numerous methods have been tried for inducing labor. The rupture of the membranes has been practised. Irritating the breasts to secure uterine contractions has been tried in some cases. Repeated vaginal douches, the application of electricity, the injection of irritating substances into the uterus, and dilatation of the cervix have all been employed. The method which has given the best results, and which is to be advised in most cases, consists in the introduction within the uterus of aseptic, flexible, and solid bougies. These may be made of various substances, and may be lubricated with glycerine or other applications. The best bougies, however, for this purpose are solid, moderately flexible, of medium size, and enveloped with silk, covered with a smooth and impervious coating. A hollow bougie should not be used. They should be prepared by scrubbing them with soap and water, rinsing them thoroughly, and soaking them for twenty-four hours in bichloride of mercury, 1 : 1,000, or lysol, 2 per cent. Although an anæsthetic is seldom needed for the introduction of a bougie, still it should be ready, and ether or chloroform should be employed. In addition to a half-dozen bougies, the operator will need a moderate-sized uterine dilator, a pair of tenaculum forceps, uterine dressing forceps, a speculum, iodoform gauze, and bichloride gauze.

A T-bandage will also be needed. Some prefer to use a speculum and to expose the os and cervix before introducing the bougie. It is better, however, not to do so, because the speculum often holds the cervix in a fixed position and prevents the easy introduction of the bougie.

The patient should be placed across a bed upon her back or upon her left side. An assistant is useful, but not indispensable. If the head of the child is low in the pelvis, it may be necessary to raise it with one hand or to instruct an assistant so to do. This is to be accomplished by external manipulation. The operator should thoroughly cleanse his hands, and, having prepared the vagina, he should pass two fingers of the left hand beneath the os and cervix. A bougie should be taken in the right hand and passed along the fingers of the left upon their palmar surface. As the bougie enters the cervix it should be given a gentle, rotating motion, which will usually assist greatly in its introduction. No force can be employed, but the introduction of the instrument should be accomplished by patience and gentle manipulation. The bougie should be inserted until but three or four inches of its length remain outside the external os. It is usually better, if possible, to introduce a second beside the first. When two have been inserted, the vagina should be moderately tamponed with antiseptic gauze, the gauze being packed about the ends of the bougies in such a way as to prevent their emerging from the uterus. It is well to insert bougies, if possible, in the early evening, because the first processes of labor—softening of the cervix and gradual dilatation—often come on without the patient's knowledge, and need not prevent her sleep. It will be found upon examination the following morning that the cervix has become thoroughly softened and the os considerably dilated, while the patient has been passing a fairly comfortable night.

In the introduction of bougies failure will be experienced if the bougies chosen are poorly made and excessively flexible. Such an instrument will double upon itself and may deceive the operator, who imagines that it has passed within the uterus.

It will also be unfavorable to the progress of labor if the membranes should be ruptured during the introduction of a bougie.

If the induction of labor is begun at evening, the physician should see his patient twelve hours afterward, during the following forenoon. The gauze should then be removed, the vagina douched with creolin, the bougie removed, cleansed, and again introduced. If sufficient dilatation be present, two others may be added. As a rule, however, active labor will begin in from three to six hours after the second introduction of bougies.

If the patient is restless and sleepless, it is an advantage to give bromides, small doses of chloral or codein to allay nervousness. These remedies also permit the dilatation of the cervix. In some cases the bougie may be removed in the morning following its introduction, and the patient be encouraged to get up and to go about her house. Sufficient separation of the fœtal membranes from the wall of the uterus often occurs during the night to cause labor to come on by this procedure.

Artificial Dilatation of the Cervix.—When dilatation has advanced sufficiently far to permit the introduction of two or three fingers within the os, and the cervix is obliterated, it will be found advantageous to use elastic dilators, such as Barnes' bags and McLean's double bag, or the large silk bag of de Ribes. The bag to be introduced should be folded upon itself, made thoroughly aseptic by lysol, which acts as a lubricant, and carried within the os in the grasp of the dressing forceps. The bag should then be distended by lysol, 1 per cent., or normal salt solution. The outer end of the tube may be closed by hæmostatic forceps, which are laid above the pubes and held in position by a light bandage. Ordinarily the effect of one of these dilators is secured in an hour after its introduction. If Barnes' bags are used, the first should be removed and the larger one inserted; if McLean's bag is employed, it should be more fully distended, each half being injected; for such injections a piston syringe is required, as the force of gravity is not sufficient to distend the bag.

De Ribes' bag is usually fully distended and allowed to remain until it is expelled in advance of the child. Either of these elastic dilators may remain in place until spontaneous expulsion or delivery of the child. After their removal the membranes are ruptured and labor is terminated. When dilatation is complete, the operator may at once secure delivery by either version or forceps, as the indication demands.

In cases where the os and cervix are very small and tightly closed, it may be impossible to introduce bougies within the uterus. An effort should at first be made to begin dilatation with the tip of the finger. If the external os can be opened at all, a narrow strip of antiseptic gauze may be packed into the os, carrying one end of the strip as far as possible into the cervix. This should be removed and another applied every three or four hours. Where haste is not imperative, sufficient dilatation can be secured by these means to permit the introduction of bougies or even to secure full dilatation.

Rapid Opening of the Cervix.—Labor must often be brought on in cases where haste is absolutely necessary. In eclampsia no time can be wasted in gradual dilatation with bougies. The os and cervix must be stretched at once by the fingers sufficiently to permit the introduction of a large elastic bag. In cases where such dilatation is impossible, by reason of a narrow and firm condition of the tissues, it is well to employ the method of incision into the os and cervix. This is best performed by angular scissors, introducing one blade within the cervix, while the other cuts from without inward.

Four incisions are usually needed—one above, one below, and one upon each side, dividing the circle of the os into four quadrants. It is best to carry the scissors to the internal os and to go through the entire length of the cervix in these incisions. The result of this procedure is most satisfactory. It is found that if the incisions are carried as far as indicated, the bleeding is but slight and transient, and that the uterus does not tear above the incisions, the internal os dilates at once, and delivery can be performed in a very short time. If the operator is without angular scissors, he may use a probe-pointed bistoury.

FIG. 174.

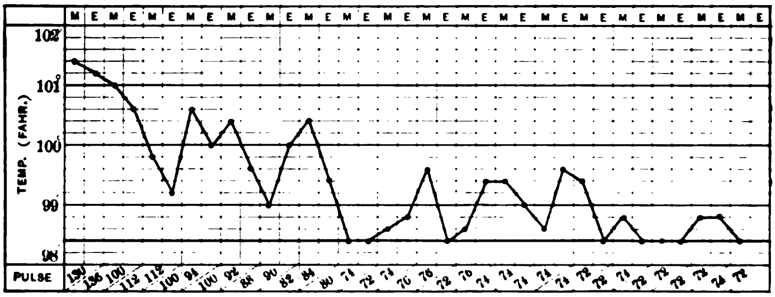


Chart.—Primipara, contracted pelvis, induced labor, delivery by axis-traction forceps, manual removal of placenta with tampon of iodoform gauze.

In cases where the os and cervix are soft and readily dilated, the physician may succeed in dilating the os and cervix with the fingers sufficiently to allow him to carry his hand, folded into a cone, within the uterus. He may then perform version or insert narrow-bladed forceps.

In cases where the cervix must be promptly opened, there is at present much testimony in favor of the use of Bossi's dilator. Under antiseptic precautions and in the hands of a skillful operator accustomed to close lacerations of the cervix, the use of this instrument is justifiable.

Mortality and Morbidity.—The induction of labor calls for especial care in the maintenance of strict antisepsis. The frequent manipulation to which the patient is subjected, and the fact that the os and cervix are not in that physiological condition which favors dilatation, and hence sustain more or less injury during artificial labor, expose the patient to unusual risk. Scrupulous attention must, therefore, be given to every detail of antisepsis.

In well-selected cases under good care induced labor of itself has no mortality for the mother. It may be performed too late to save her from some dangerous condition, but the operation itself in proper hands is a safe one.

The risk to the child, however, is considerably increased. If labor be induced some weeks before the normal end of gestation, the child is not fully developed, and hence has not the resisting power of the infant at term. Because the os and cervix are not soft and ready to dilate, the child may be subjected to fatal pressure if delivery is attempted before dilatation is complete or without suitable incisions. Prematurely born infants often require incubation and artificial feeding. These disadvantages, however, are not insurmountable, and can be overcome with careful attention.

The prognosis for the life of the child delivered by induced labor will depend upon the period of gestation at which the operation is done, the strength of the child, and the care which it receives. If such a labor be properly managed and the child well cared for, the majority of such children are saved.

The induction of labor should not be undertaken in cases where life is at once threatened without full understanding with the parents or friends of the child, and with the knowledge that the operation is one which is mainly in the interest of the mother. With the good results obtained by surgical delivery, the mother must be informed that she has a choice in some cases between exposing her child to the risks of premature birth or assuming herself a greater danger than normal by surgical delivery at full term.

CHAPTER III.

THE IMMEDIATE DELIVERY OF THE CHILD.

The necessity sometimes arises for the immediate termination of pregnancy. Labor in highly contracted pelvis, where it is impossible for the mother to expel the child, a dying condition of the mother while the child remains living, cases in which the lives of mother and child are threatened by hemorrhage, or in cases of eclampsia where immediate delivery is desired, afford examples of this condition. Under these circumstances, the operator must choose between delivery through the vagina and delivery by abdominal incision. In contracted pelves, where the head is not engaged, the risk to mother and child of delivery through the vagina is very great. It is scarcely possible for the child to survive such delivery, while the mother will sustain more or less injury. If the life of the child is to be saved in such a case, delivery by abdominal incision is indicated. If the child has ceased to live or is in bad condition, embryotomy is the operation of choice.

In cases complicated by hemorrhage judgment is often difficult. Unless the case is seen early and the fœtal heart sounds are strong and good, the life of the fœtus should not be taken into consideration in consulting the mother's interest. In placenta prævia, where the os and cervix are tightly closed, the patient a primipara in good condition, where the fœtus is also living and in good condition, and where a decided hemorrhage has already occurred, delivery by abdominal incision may save the lives of mother and child. Where, however, sufficient hemorrhage has occurred to risk the life of the fœtus, further bleeding should be controlled and the patient delivered through the vagina in the interests of the mother. In the presence of impending maternal death, with the child living and in good condition, its delivery must be effected in accordance with the circumstances of the case. If dilatation is complete and the head is in the pelvic cavity, forceps should be employed. If the cervix is tightly closed and the head not engaged, abdominal section must be performed. Where immediate delivery is indicated in eclampsia, there is usually considerable dilatation of the cervix, with partial engagement at least of the head. In a primipara with resisting cervix without dilatation, and when the child is in good condition, in maternity hospitals delivery by abdominal section is justifiable.

Methods of Securing Rapid Delivery Through the Vagina.—Dilatation of the cervix may be rapidly effected in many cases by the use of the hand. Under complete anæsthesia, if one finger can be carried through the cervix, it may be swept around the cervix, enlarging its calibre until a second finger can be introduced. The cervix can thus be opened by the introduction of the fingers until the hand, folded like a cone, can be carried within the cervix. Then, by opening the fingers or by employing the fingers and thumb, dilatation can be carried to the point where the breech can be brought down by traction upon the leg or where the forceps can be introduced and the child delivered by the head. In multiparæ where the tissues are relaxed, if the uterus can be pressed down in the pelvis, it may be possible to reach the cervix with the fingers of both hands. Then, by inserting one or two fingers of each hand within the cervix, the backs of the hands toward each other, the fingers may be carried around the cervix in opposite directions, exerting very considerable force. This procedure cannot be carried out in primiparæ where the vagina is undilated and the pelvic floor resisting.

The invention of Bossi's dilator has introduced a new factor in rapid dilatation of the cervix. This powerful instrument, when its blades are widely opened, gives a diameter sufficient to permit the introduction of the hand within the womb or the application of forceps. Its use is attended with very positive danger from laceration, hemorrhage, and infection. In many cases in which its use would be desirable, as in placenta prævia, the cervix is abnormally soft, and would tear more readily than in normal cases. The instrument itself is complicated and heavy, and must be cleaned with great care. Sufficient time has not elapsed since its introduction to give a positive verdict regarding its value. Its modifications contain no especial advantages.

Multiple incisions of the cervix by Dührssen's method afford a prompt, clean, and aseptic method for opening the womb. In the hands of a skillful operator the danger of hemorrhage and infection is little. The incisions frequently heal without suture.

The use of elastic bags, unfortunately, does not give sufficiently rapid dilatation of the cervix to meet the exigencies of all cases. At least an hour is required for sufficient dilatation to permit safe delivery through the cervix. Where, however, these dilators can be used, they are reasonably safe and efficient. Care should be taken that they are in good condition, for if a bag bursts under distention fluid and air may gain access to the interior of the womb.

The most rapid method for the delivery of the child consists in abdominal and uterine incision. For this to be successful, antiseptic precautions are necessary, an operator of experience, with good assistants, must perform the operation, and there must be sufficient help to care for the child. These circumstances will naturally limit immediate emptying of the uterus by abdominal and uterine incision to maternity hospitals and to cases under experienced hands in clean private houses where abundant assistants can be procured. Under favorable conditions, abdominal and uterine incision afford the quickest and, for mother and child both, the most successful method for immediate delivery.

In no experience in medicine is better judgment demanded than in the choice of a method of delivery in these cases. The operator must take care that he is not led away by a desire to perform abdominal delivery, or, on the other hand, that he does not shrink from its responsibilities. If he has not knowledge, experience and skill sufficient to meet the demands of such a case, he should immediately transfer it to those who have. No emergency of general surgery is so grave, and in none are two lives at stake. Under proper conditions, however, the modern treatment of cases requiring immediate delivery has proved most successful, and has completely reversed obstetric history.

SECTION II.

THE SURGERY OF LABOR.

CHAPTER IV.

DILATATION AND INCISION OF THE CERVIX; EPISIOTOMY

Normal Dilatation of the Cervix.—In spontaneous labor the cervix is dilated by the hydrostatic pressure of the bag of membranes containing the amniotic liquid and by the retraction of the muscular fibres of the uterus. The effect of this combined action is to open the cervix gradually and symmetrically without further injury than shallow tears of its mucous membrane. Dilatation is also made complete by the thinning of the cervix, which results from the continuous pressure of the presenting part. When all the factors of labor are normal, laceration does not occur, but the edge of the cervix may be reduced to such thinness that it is with difficulty distinguished from the fetal membranes.

Abnormal Dilatation of the Cervix.—Delay in the dilatation of the cervix may result from alteration in its tissue, making it less elastic and dilatable than normal; from the absence of amniotic liquid in the bag of membranes and from conditions which make it impossible for the presenting part to descend and make pressure against the cervix. The head is the best portion of the fetus for cervical dilatation, while the breech is inferior because it is softer and not so large. In patients above the average age of childbearing and primiparous, it is not uncommon to find at the internal os a ring of thin dense tissue, which dilates with great difficulty. In other cases the tissue of the cervix is friable, brittle, and may tear before the advancing head without dilating. A branch of the cervical artery may be opened by such laceration. In patients of highly irritable nervous system a condition of spasm in the cervix may be present which resists dilatation and may greatly prolong labor.

Non-operative Treatment of Failure of Cervical Dilatation.—Where spasm of the uterine muscle is present as the result of a highly irritable condition of the nervous system, sedative medicines greatly further dilatation of the cervix. Codein or morphia or aqueous extract of opium by rectal suppository are especially valuable. Bromides and chloral hydrate serve a useful purpose in some cases.

The local application of drugs to the undilated cervix is occasionally of value. Formerly the effort was made to advance dilatation by applying belladonna ointment to the cervix, and this seems to have been useful with some patients. Chloral dissolved in glycerine may be used upon pledgets of cotton placed against the cervix. Experiments have been made by injecting cocaine into the cervical tissue. Hot vaginal douches have also been used. Purgative medicines are thought to further dilatation, and especially castor oil, which has considerable domestic reputation for bringing on labor.

Instrumental Dilatation.—Where there is ample time, and in cases where an oozing discharge of blood is present, gradual dilatation of the cervix by tamponing with iodoform gauze is a safe and efficient method. The vagina should be cleansed antiseptically, the bladder and rectum emptied, and the patient placed upon the back or side. With the aid of a speculum, the cervix is exposed, and may be steadied by tenaculum forceps. Gauze containing 10 per cent. of iodoform in a suitable strip is then packed firmly into the cervix and about it. A moderate packing of bichloride gauze completes the applications. Such packing may remain twelve hours unless some indication arises for its earlier removal. Should active labor pains come on or hemorrhage persist, packing must be removed and an examination made. The method of dilatation by gauze packing has largely superseded the use of tents. Of these only the laminaria tent is permissible. Sponge tents should never be employed, for they cannot be adequately sterilized, and infection may result.

Manual Dilatation.—Dilatation by the hand is well adapted to secure prompt opening of the cervix, and is, under most circumstances, a safe and efficient method. For this the patient is prepared as for dilatation with gauze. The hands and arms of the operator are made aseptic, and the fingers are lubricated with lysol or creolin. With the patient upon the back or side at the edge of a bed or table and anæsthetized, the operator inserts one finger through the cervix, sweeping it about the complete circle of the os. As soon as possible a second finger is added, and then the thumb. By extending the thumb and fingers, steady pressure and a rotary motion, the cervix can be gradually opened to a considerable extent. If there is need for haste, and the cervix can be drawn down and the pelvic floor is capacious and yielding, two fingers of each hand may be introduced, with the backs of the hands against each other. By making strong extension with the fingers and a rotary motion, strong pressure can be brought to bear upon the cervix, and when three or four fingers of each hand can be inserted, the cervix is readily dilated. In cases where bleeding is present, as in placenta prævia, dilatation may be accomplished by using the fist as a cone, gradually pressing through the cervix, while the finger tips penetrate the placenta. Under antiseptic precautions and performed by a skilful operator, manual dilation of the cervix is a safe and efficient method. Done without antiseptic precautions and without experience, the cervix may be torn, the peritoneal cavity opened, and severe hemorrhage and fatal infection may follow.

Elastic Bags or Colpeurynters.—Barnes', McLean's, De Ribe's, and Voorhees' elastic bags are all available for dilatation of the cervix. Each has its advantages. Barnes' is smallest in some of its sizes, and remains well in the cervix because of its shape. It can be introduced when the cervix is but partially dilated, and is not readily expelled. McLean's bag is double, and has the advantage that, once within the cervix, each half may be dilated separately, the entire bag producing efficient pressure and considerable dilatation. Barnes' and McLean's bags are designed to remain within the cervix.

De Ribe's bag is intended to be inserted within the uterus, its base resting against the presenting part of the fœtus and its apex protruding through the cervix. When fully distended, it is almost as large as a fœtal head at term, and is designed to be spontaneously expelled, followed by the fœtus. Voorhees' bag is also intended to be placed within the uterus, its base resting against the presenting part and its apex within the cervix. It is smaller than De Ribe's, much more simple and not so strong. De Ribe's bag is not very elastic, as it is made of silk, covered with rubber, while Voorhees' bag is made of the best quality of rubber.

Dilatation by bags imitates dilatation by the fœtal membranes and amniotic liquid. It makes an even pressure upon the cervix, and hence is not apt to severely injure the mother. The disadvantages of this method lie in the fact that bags may burst during distention, and that air and fluid thus gain access to the uterine cavity. A bag, when distended, may separate the placenta, and thus cause hemorrhage. If a fully-distended bag be pulled through the cervix by its tube, it may cause considerable cervical tear. There is no way of preventing rupture of an elastic bag, except by testing before use and by distending the bag slowly and gradually. Sterile or antiseptic fluid should be invariably employed, so that the presence of this fluid within the uterus will not cause infection. It is not good practice to pull a distended bag through the cervix, but in some cases the bag may be partially emptied and then slowly and gradually delivered by traction. The effect of elastic bags in producing dilatation is reasonably rapid, for sufficient opening of the cervix can usually be obtained in between one-half and one hour to make delivery possible.

Bags should be sterilized by boiling, and the patient should be prepared for the introduction of elastic bags by having the bladder and rectum emptied, the external parts shaved and made antiseptic, and the vagina thoroughly cleansed. The bag may be carried within the cervix by uterine dressing forceps, and gauze should be ready for tampon of the vagina. A speculum may be necessary to depress the pelvic floor, or the operator may use the fingers of the left hand for that purpose. For distending the bag, a smoothly-working, strong piston syringe and an abundance of lysol, 1 per cent., or sterile salt solution or sterile water should be in readiness. The bag should be folded upon itself and dipped in lysol or creolin, and if it is a bag intended to remain within the cervix, it should be passed into the cervix and held by the forceps while an assistant distends the bag with fluid injected by the piston syringe. The tube of the bag may be clamped with hæmostatic forceps, and the bag retained in place by a vaginal packing of bichloride gauze. If McLean's bag is used, in a half-hour the other half of the bag may be distended, and each half tested by attempts to introduce more fluid at intervals of twenty minutes to a half hour. If De Ribe's or Voorhees' bag is used, it is passed within the uterus, its apex only remaining in the cervix. These bags may be considerably distended as soon as introduced, and allowed to remain in that condition. Additional fluid may be introduced at intervals of twenty minutes or half an hour until the distention of the bag is complete. Should active labor come on, these bags are usually expelled in advance of the child, and serve to dilate the vagina and pelvic floor, and thus to prepare for the exit of the fœtus.

Dilatation of the Cervix by Using the Fœtus as a Dilator.—In cases where the mother's interests are alone to be regarded, and where the life of the fœtus is probably lost, the fœtus may be used as a dilator. This is accomplished by performing version and by bringing through the cervix one leg and thigh of the child, and gradually both lower extremities and the breech. This method controls bleeding from placenta prævia efficiently, and is an efficient method of dilatation. In using this method, no haste should be made to extract the child. It must be considered as a dilator, and plenty of time must be given to secure softening and dilatation of the cervix. Occasionally, when the cervix yields readily and the fœtus was in fair condition when dilatation commenced, a living child may be obtained.

The Use of Bossi's and Other Metal Dilators.—By Bossi's dilator it is claimed that the cervix may be safely opened sufficiently to permit the delivery of an average fœtus in thirty minutes. This instrument is too recent at present to enable us to give a definite verdict regarding its value. There is, however, sufficient evidence in its favor to make a trial of its merits imperative.

For its employment the instrument must first be sterilized by boiling it in water containing one teaspoonful of bicarbonate of sodium to the pint. As the instrument is complicated with many joints and threads, boiling in plain water is not sufficient to thoroughly cleanse it. The patient is prepared as for any other method of dilatation, and is placed upon the back or side. Antiseptic precautions should be strictly observed by the operator and all who assist. If the cervix is tightly closed, the guards upon the tips of the dilators should be removed and the dilator, completely closed, introduced within the cervix. By turning the wheel of the instrument, the blades may be gradually separated and dilatation begun. As the instrument is a powerful one, it works with apparent ease, and in this lies its greatest danger. Severe laceration of the cervix may accompany its use, requiring suture and possibly the use of the tampon in addition: hence the operator should dilate with great patience and gentleness, stopping to allow the tissues to yield gradually, but increasing the distance between the blades. When the index gives a dilatation of 8 cm., dilatation has proceeded to the point where the hand can usually be passed into the uterus if necessary. Dilatation is complete, so far as the instrument is concerned, when the index registers 11 cm. To withdraw the instrument, it should be closed and the fingers of the left hand passed within the cervix to be sure that the blades of the dilator are easily removed and that the guards upon the tips retain their position. After delivery the cervix should be carefully examined, and extensive lacerations immediately closed by suture. Modifications of Bossi's dilator are not as yet of sufficient importance to merit detailed consideration.

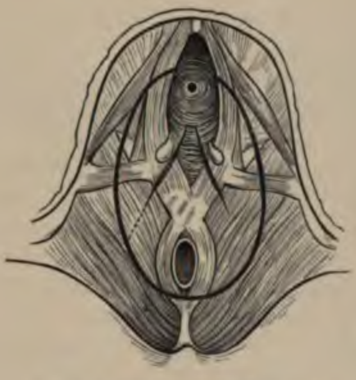
For beginning dilatation of the cervix and for curetting in early pregnancy, the solid dilators are especially valuable. They rarely wound the tissues, and their only danger lies in the fact that, in incompetent hands, such an instrument could be carried through the fundus of the womb.

Dilatation of the Cervix by Incision Dührssen's Method.—The cervix may be rapidly and efficiently opened by four incisions carried to the vaginal junction, and made by blunt-pointed scissors. Dilatation may be greatly promoted where a thin, resisting band is felt at the internal os by nicking this band with a probe-pointed bistoury. Should the cervix tear before the head, it should immediately be incised and delivery effected.

For opening of the cervix by incision, the patient should be prepared in the manner already described. Stout scissors, with blunt-pointed blades, either straight or with the blades at an angle with the handles, should be used. The cervix should be grasped by tenaculum forceps, and the pelvic floor retracted by a speculum. The incision should not be made at the lateral surface of the cervix, where the vessels are most numerous, but obliquely in the circle of the os, two incisions above and two below. The cervix is thus cut into four flaps, and the os is opened at once. The mistake must not be made of using too short incisions, for such would only open the external os, without influence upon the internal. Little or no hemorrhage accompanies this procedure, and delivery may immediately follow at the discretion of the operator. In most cases the flaps fall into good apposition, and may not require suture. Should there be bleeding, or should apposition be imperfect, suture with chromicized catgut should be immediately employed. If there is a tendency to bleeding, the uterus should be tamponed with iodoform gauze and the cervix firmly packed with dry bichloride gauze.

Episiotomy. By episiotomy is understood the making of incisions into the border of the vulva and vagina to further dilatation at the moment of birth. This procedure is based upon the division of the pelvic floor into anterior or upper segment and posterior or lower segment. In normal labor the anterior or upper segment, which comprises the anterior wall of the vagina and the tissues about the urethra, is pushed upward and forward beneath the pubic arch. As the head emerges the posterior or lower segment is carried downward and backward, including the posterior two-thirds of the pelvic floor, the posterior vaginal wall, and rectum. In cases where the muscles and fascia which form the rim or sphincter of the vulva are tense and resisting the action of these two segments of the pelvic floor is interfered with, and under strong pressure the head will force its way downward, tearing the pelvic floor at each side from its attachments to the pelvic bones and fascia and tearing the perineum in the central line often to the rectum. The purpose of episiotomy is to cut this tense, resisting, sphincter-like band of tissue and thus permit the two segments of the pelvic floor to dilate in the normal manner.

FIG. 175.



Double episiotomy. (DÜHRSSEN.)

The advantages of episiotomy are those which a clean incision has over a ragged tear, so far as union is concerned. The incisions are also above the floor of the vagina, and hence are out of the way of the lochial discharge. They are readily sutured and usually heal by first intention. The disadvantages of episiotomy are the facts that it inflicts additional pain upon the patient unless she be anæsthetized, and that it seems to add an operative interference to the pain and discomfort of labor. As these disadvantages do not outweigh the gain which this simple procedure brings about, and as episiotomy is not needed in cases in which anæsthesia is not employed, the reasons against its use lose weight entirely.

A blunt-pointed bistoury or blunt-pointed scissors with narrow blades may be employed to make the incisions. A point upon the vulva should be chosen at the juncture of the lower third with the upper two-thirds. The direction of the cut should be downward and slightly outward, and its extent from an inch to one and one-half inches. It is best done by laying the blade of the knife or scissors upon the side of the child's head, inserting the blade an inch within the vagina. When a pain comes on the blade is then turned with its cutting-edge outward toward the wall of the vagina, when the tissues will divide before the edge of the blade.

The raw surface that is left after episiotomy is surprisingly great to one unaccustomed to this procedure. The tissues instantly retract both upward and outward, and there is left a triangular, raw surface, the base of which marks the extent of separation at the outer extremity of the episiotomy-cut. The bleeding is but slight, as only mucous membrane, connective tissue, and thin muscular fibre are divided. The difference in the dilatation of the pelvic floor and vagina is great. The posterior wall of the pelvic floor instantly drops downward and backward, and the head is usually born rapidly and without difficulty. As soon as labor is complete the incision should be closed by a continuous suture of catgut. The suture should begin upon the inner aspect of the line of incision, and should follow the line of incision directly along the inner aspect of the vaginal wall. It is often necessary to continue the line of suture downward upon the skin-aspect of the incision, thus closing both edges. The lines of suture should then be powdered heavily with boric acid or iodoform, and the suture need not be removed.

Episiotomy is especially serviceable in forceps deliveries where the head is evidently too large to be brought through the vulva without laceration. Its performance will frequently save a tear of the pelvic floor in the lateral sulci and prevent a central tear of the perineum.

Central incision of the perineum has been practised to promote dilatation and to save extensive laceration. It is rarely employed. In cases where the operator sees that extensive and ragged laceration of the vagina and pelvic floor is inevitable, central incision may be useful. In most cases, however, episiotomy is preferred.

CHAPTER V.

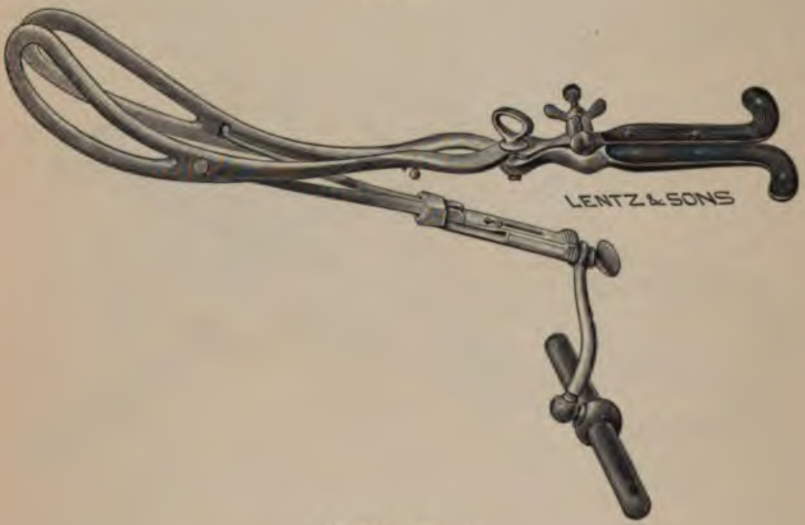
THE FORCEPS.

Description.—By the obstetric forceps is understood an instrument resembling a pair of hands, composed of two portions, crossing one upon the other and fastened together by a lock. The origin of the obstetric forceps seems to have been in separate sharp hooks which were used to extract a dead fœtus. The effort of Chamberlin, of England, to keep the instrument a secret for his own profit is familiar to all interested in the literature of obstetrics. Various obstetricians have modified the forceps and changed its model.

In later times obstetric forceps have been modelled after one of two patterns—one that of Tarnier and the other of Simpson. At present no obstetric forceps meets the requirements for which the practitioner depends upon the instrument which is not fitted to make traction in the axis of the pelvis—to make axis-traction.

Each blade of the forceps is composed of three portions—a concave, expanded part of the instrument, which resembles the flexed hand and which is called, because it fits upon the head of the child, the cephalic portion. At the outer extremity of each blade is the portion grasped in the hands of the physician, and called the handle; between these two parts is the remainder of the blade, called the shank, upon which is found the lock. The two blades of the forceps are named right and left, in accordance with the portions of the mother's pelvis at which each is applied; thus, the left blade of the forceps, which is inserted first, is passed along the left side of the mother's pelvis. It should also be grasped in the left hand of the physician for insertion. The right blade is that which is applied upon the right side of the pelvis, lying uppermost upon the left blade, and is grasped in the right hand of the operator. In most forceps the cephalic portion contains an oval opening, known as the fenestra. This is shaped differently in different forceps, varying chiefly in width. There are two sorts of locks commonly employed upon the forceps. That found upon Simpson's consists in a groove upon the lower or left blade, into which fits a ledge formed by cutting in the upper or right blade. This lock is most easy to bring together, but does not keep the blades in close apposition, and requires constant pressure or traction upon the forceps to maintain the blades in a locked condition. The French lock consists of a

FIG. 176.

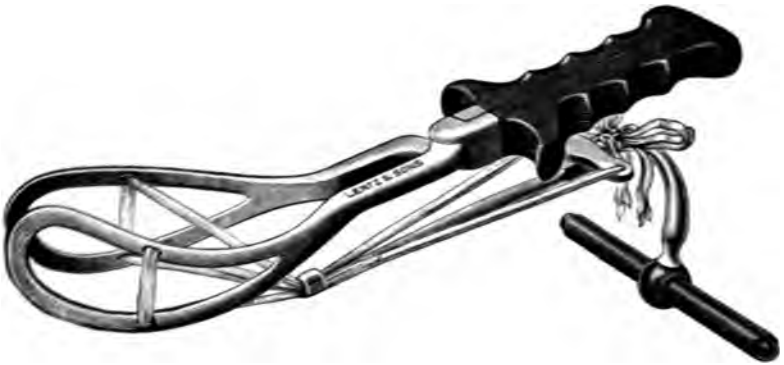


Tarnier's forceps.

screw upon the lower or left blade terminating in a thumb-piece. Upon the upper or right blade is a notch into which the screw is fitted. The handles of well-made forceps are of steel, nickel-plated, or of hard rubber, moulded, while hot, upon the handles and smoothly polished. Well-made forceps are sufficiently heavy to prevent springing or bending of the blades; they must be perfectly smooth and heavily nickel-plated to prevent corrosion. Forceps vary in length from ten to fourteen inches, and also in weight, depending upon the use of metal or rubber in the handles and also the weight or lightness of the instrument. As a rule, heavy forceps are better than light, because the danger of bending is not present and because in skilful hands less force is needed to perform extraction than with the light instrument.

Appliances for Axis-Traction.—Various devices have been employed to secure axis-traction. The simplest of these consists in a stout cord or tape which is passed over the forceps at the shank near the lock, while traction is made downward upon this cord. The same result is obtained by passing the cord or tape through the fenestræ in one or both of the blades, and thus making traction upon the cephalic portion of the blade. A better use of the tape, devised by Poullet, consists in boring holes through the edges of the fenestræ and passing the tape through these holes, as shown in the accompanying illustration. A simple method consists in perforating the forceps blade just externally to the fenestræ and passing the tapes through the apertures.

FIG. 177.

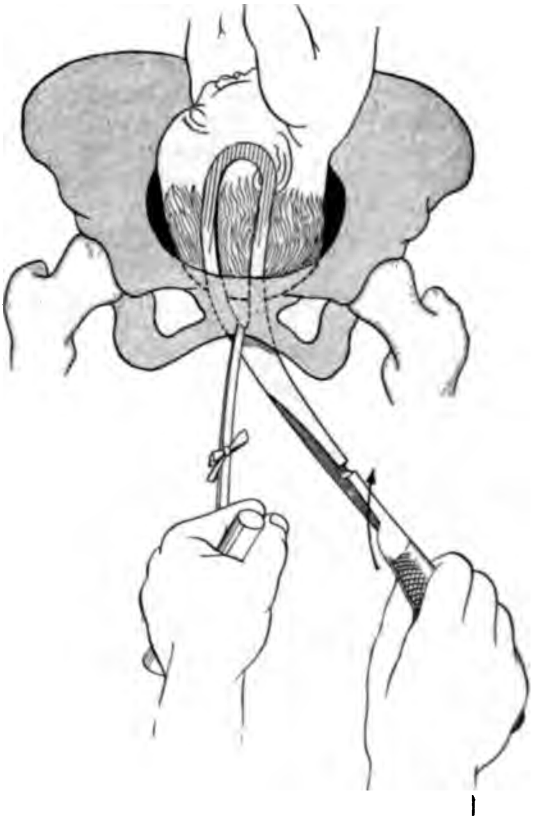


Simpson's forceps, fitted by the author with tapes and traction-bar.

Various kinds of metal hooks have been employed for making axis-traction. Those of Reynolds are inserted at the external extremity of each fenestra. Others are slipped over the shank internally to the lock. Tarnier and Simpson have employed jointed rods, to which are attached transverse handles to secure axis-traction. In axis-traction instruments which are intended to be clamped upon the head of the child, in addition to the lock, a binding-screw is often added. This extends laterally from one blade to the other, the handles being brought together by a thumb-screw. Well-made forceps are as simple as possible, containing no complicated joints which cannot be thoroughly cleaned and rendered aseptic.

Function of the Forceps.—Forceps are designed usually with one of two objects. In most cases the obstetrician endeavors to apply the instrument to the sides of the child's head. This requires an instrument whose blades are especially adapted to fit over the fœtal head. When the blades are joined the handles will be found close together, while the shanks are thus brought one above the other. In forceps which may be applied to the sides of the pelvis and not closely fitted to the sides of the child's head, the blades do not fit so perfectly over the head, the handles are not closely approximated, while the shanks are considerably further apart. Although various modifications of these two types of forceps have been made, they have been of little importance except to publish the name of the person making the modification.

FIG 178.



Axis-traction, forceps to sides of head. (FARABŒUF and VARNIER.)

screw upon the lower or left blade terminating in a thumb-piece. Upon the upper or right blade is a notch into which the screw is fitted. The handles of well-made forceps are of steel, nickel-plated, or of hard rubber, moulded, while hot, upon the handles and smoothly polished. 'Well-made forceps are sufficiently heavy to prevent springing or bending of the blades; they must be perfectly smooth and heavily nickel-plated to prevent corrosion. Forceps vary in length from ten to fourteen inches, and also in weight, depending upon the use of metal or rubber in the handles and also the weight or lightness of the instrument. As a rule, heavy forceps are better than light, because the danger of bending is not present and because in skilful hands less force is needed to perform extraction than with the light instrument.

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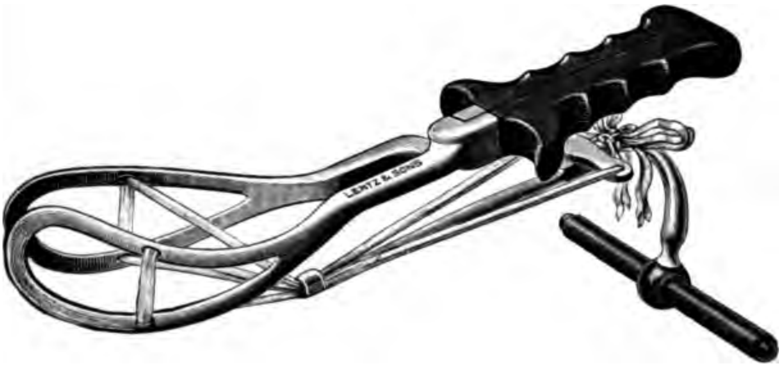

Simpson's forceps, fitted by the author with tapes and traction-bar.

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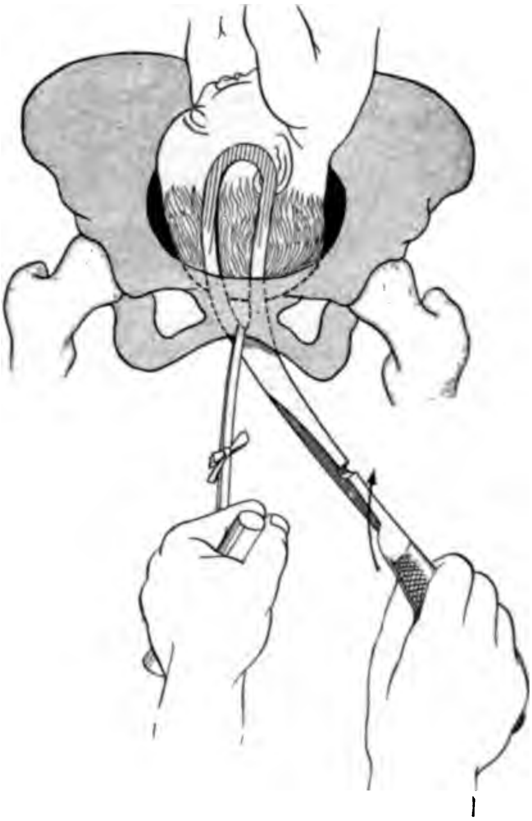
FIG 178.



Axis-traction, forceps to sides of head. (FARABOEUF and VARNIER.)

The function of the forceps is to make traction only. It is not to be used as a lever, nor as a rotator, nor as an instrument to crush a fœtal head.

Indications for the Use of Forceps.—The indications for application of the forceps are danger to mother or child or to both by reason of delay in delivery. Certain conditions must be present to make the use of the forceps possible, and unless these conditions are at hand the forceps becomes a very fatal and dangerous instrument to mother and child.

Engagement of the Presenting Part.—It is absolutely necessary for the successful use of forceps that the fœtus and the pelvis be proportionate in size. No greater mistake can be made than the endeavor to use the instrument in cases where the child is too large to pass through the pelvis. The practical test to determine this fact is the presence or absence of engagement of the head. If thorough examination under anæsthesia, if needed, shows that the head has not begun to engage, an effort must be made to bring this about by pressing the head downward and backward above the pelvic brim. Engagement can sometimes be effected in this way, aided by Walcher's position. If the head be not engaged, and if it does not engage with good labor-pains and judicious manipulation, the use of the forceps is absolutely forbidden. In all cases which have not been measured by a pelvimeter pelvimetry should be practised, if possible, before the forceps is applied. Information of great value may often be gained by this procedure, which will assist the physician in performing delivery.

Fœtal Presentation.—It is also necessary for the use of forceps that the head or the breech present. It is rarely necessary to apply forceps to the breech, although it can be done with good result. The membranes must have ruptured, and the cervix must be fully dilated or sufficiently opened to admit the instrument, and so elastic as to be easily dilated. The position of the head must be favorable for delivery. It is rarely necessary to apply forceps when the face presents or when the occiput has not rotated to the front.

Maternal Indications.—The positive indications for the use of the forceps are the mother's failure to deliver herself. Good judgment is often required to determine whether the mother can or cannot accomplish delivery. The practitioner must review the factors necessary to the accomplishment of spontaneous labor, and endeavor to supply those which are lacking before using forceps. He is not, however, to wait until exhaustion is present, as this error is quite as dangerous as the unnecessary use of the forceps. The signs and symptoms that the mother cannot deliver herself are progressive failure of uterine contractions, which do not improve by giving the mother rest under obstetric anæsthesia or with the administration of quinine or stimulants. The mother's general aspect must be that of fatigue and inability for muscular exertion. It is unwise to wait until the mother's pulse is so rapid as to indicate shock. It is also unwise to wait until the vagina and pelvic floor are without the usual secretion of mucus or are swollen from the effect of pressure. It will be remembered that in normal labor the head advances and recedes slightly with each pain. When, however, the head does not recede, but remains fixed after several pains, this furnishes a valuable indication for artificial delivery.

Fœtal Indications.—The fact that the child is in danger, demanding instrumental delivery, is ascertained by noting the rate of the fœtal heart-beat, which becomes either more rapid and weak or slower and weaker than the average. Violent fœtal movements sometimes indicate danger to the child, as they are often caused by beginning asphyxia. Discharge of meconium indicates threatened danger to the child.

Preparations.—The conditions which demand the use of forceps should be made known to the husband or to the nearest responsible relative of the patient and the consent to operation be obtained. The patient should not be informed in detail concerning the operation, but she should consent to receive assistance from the operator. A competent anæsthetizer, and, if possible, one accustomed to obstetric work, is required. A thoroughly trained nurse should be in charge of the patient and an additional competent nurse is exceedingly useful. In private houses, an operating table should be improvised, and, if possible, preparations made for the operation in a room adjoining the one occupied by the patient. The table should be covered by clean blankets and sheets and considerable space beneath the table should be covered by some clean material. A good light is necessary, and several small tables or large, flat-bottomed chairs are needed upon which instruments and dressings may be placed. If the weather is cold, the room should be suitably warmed. At the foot of the bed should be placed an inflated rubber pad and beneath the bed a jar or tub to receive fluids. Upon the table may be laid a sheet, folded in the longest way, so placed that when the patient is put upon the table the sheet will be beneath the occiput and readily passed over the shoulders. The patient should be prepared for delivery by forceps by emptying the bowel thoroughly by enema, and by trimming away or shaving the hair from the external genital organs. Preparation should be made to catheterize the patient, and to cleanse the vagina with tincture of green soap and water and an antiseptic solution after the patient is placed upon the table and under the anæsthetic. Ether is the anæsthetic of choice for forceps operation, because it is desired that the uterus shall contract with each traction upon the forceps, and the stimulant properties of ether are especially useful. If the patient resists ether, anæsthesia may be begun with a small quantity of chloroform with abundant fresh air and anæsthesia may be continued by ether.

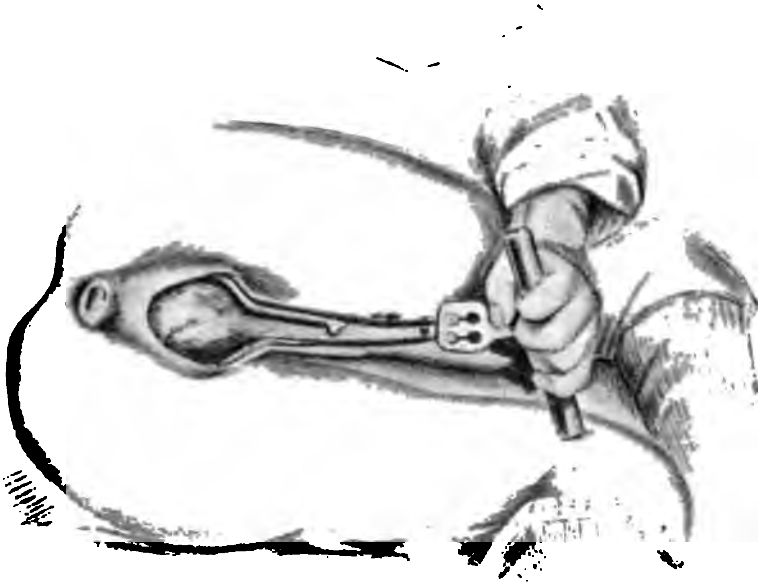
The obstetric forceps, needle forceps, needles, suture and ligature material, uterine dressings forceps for inserting gauze, hæmostatic forceps, catheters and glass douche tube, scissors and a needle for transfusion or hypodermoclysis, with rubber gloves, should be placed in a sterilizer and thoroughly boiled in 1 per cent. solution of lysol. Chromicized catgut and silkworm gut with good quality of silk for tying the umbilical cord are required. Iodoform gauze strips four inches wide and several yards long should be in readiness in sterile bottles. Aseptic ergot for hypodermatic use should be at hand, and also a hypodermic syringe containing 1-15 gr. of strychnia and 1-150 of atropia in solution. As the head may press upon the urethra and partially occlude it, it may be difficult to use the ordinary soft rubber catheter. English catheters are better for this purpose. A child's bath tub, with hot and cold water, and brandy or whiskey should also be in readiness.

The operator and nurses or assistants should thoroughly antisepticize the hands by any efficient method preferred. The operator and the nurse or assistant who handles his instruments should wear sterile operating gowns covering the clothing. A plentiful supply of 1 per cent. lysol at a temperature of 110° F. should be in readiness, and also sterile normal salt solution or boiled water. A fountain syringe, which has been boiled, should be at hand, to which can be attached, if necessary, the glass douche tube sterilized with the other instruments. The operator may wear rubber gloves during the entire operation, or, as some prefer, he may conduct the delivery by forceps without gloves, but use one glove upon the hand which delivers the placenta if he is obliged to insert the hand within the uterus. When the patient is anæsthetized and has been placed upon the table, she should be catheterized and the thighs and abdomen should be covered by sterile linen. Sterile towels should also be placed upon the bed beneath the patient. A plentiful supply of sterile cotton sponges in bichloride solution of 1 : 2,000 should also be in readiness.

Position of the Patient.—It is usual to place the patient on her back at the edge of a bed or table. Where, however, it is necessary to apply the forceps high in the pelvis it is sometimes advantageous to turn the patient upon her side, as the operator can then make traction better downward and backward. If assistants are present, they must support the limbs, which are flexed upon the pelvis. If there are few helpers, the limbs may be kept up by a sheet around the patient's shoulders, or they may be placed in chairs. When the patient is sufficiently anæsthetized, the physician should introduce all the fingers of the antiseptic hand with which he proposes to make an examination, using sufficient of the hand to palpate the head distinctly. He must study carefully its position and degree of engagement and whether the head seems of unusual size and hardness.

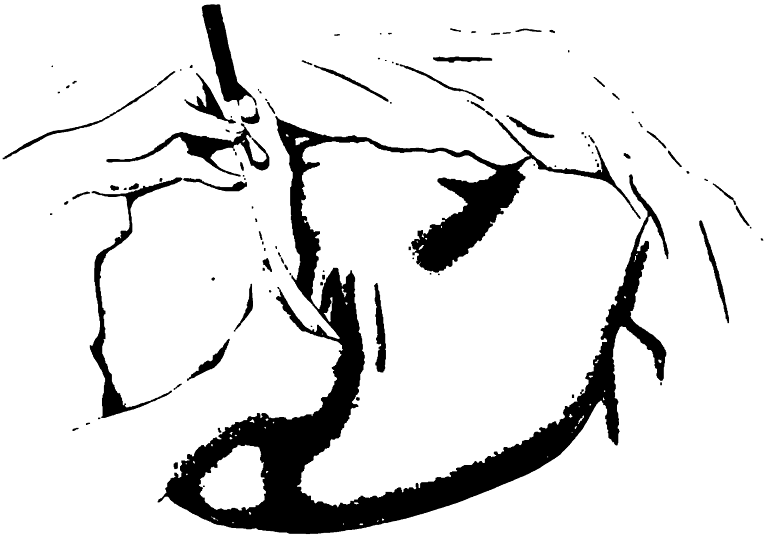
Application of Forceps.—In the simplest cases, in which rotation has occurred, while the head remains upon the pelvic floor, the forceps is to be applied straight in the pelvis, the blades upon the sides of the child's head. Before applying the instrument the physician must introduce the right hand sufficiently far so that the hand is hidden in the vagina as far as the thumb. The right hand should pass to the left side of the mother's pelvis, between the head and the pelvis. The

FIG. 179.



Head on perineum, forceps delivery, patient on her right side. (HART.)

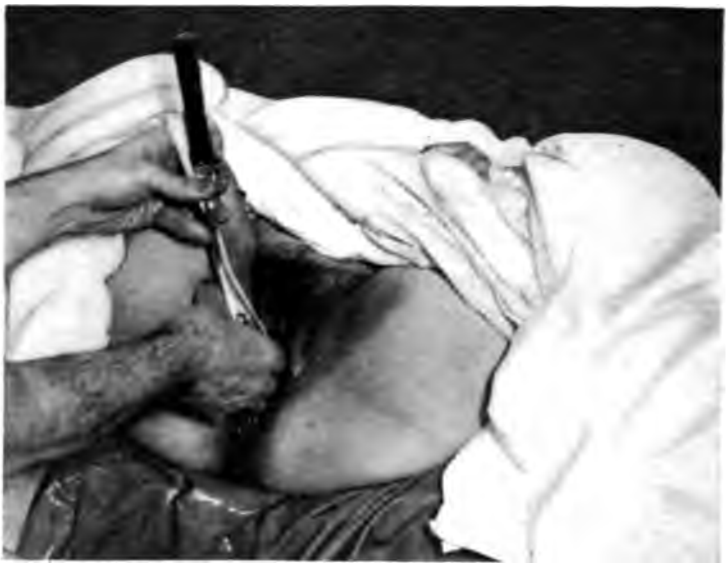
FIG. 180.



Delivery by forceps, application of the first or left blade. (From original drawing.)

left blade of the forceps must then be grasped about its middle by the left hand of the physician, in such a manner that it balances easily in the hand. The blade should then be held parallel to Poupart's ligament of the right side, the cephalic portion of the blade passing along the concavity of the right hand of the operator. The lower border of the cephalic portion of the blade should ride upon the thumb of the right hand and may be guided by the thumb. If the blade is skillfully applied, by simply dropping the handle, it will glide easily to its place. The left hand of the operator should then be inserted upon the right side of the mother's pelvis, the right blade grasped by the right hand of the operator, held parallel to Poupart's ligament of the left side, and inserted in the manner described. During the insertion of the right blade it will be necessary to depress the handle of the left blade to give the operator room. When the blade has been inserted a careful examination should be made to be sure that the blades are grasping only the head. The forceps should lock easily, and if this is not the case they have not been applied to the sides of the head. Should this occur, the blades must be unlocked and slightly shifted until it is found that they have been properly applied.

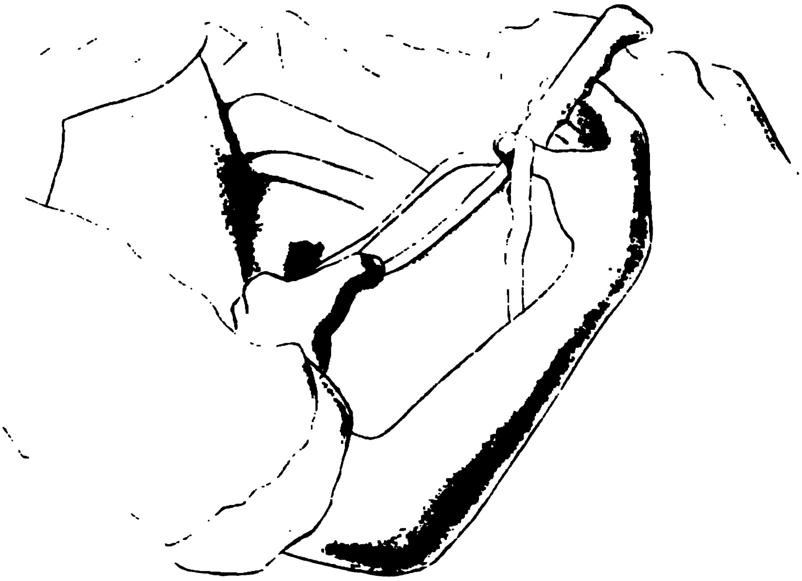
FIG. 181.



Application of left blade. (From photograph.)

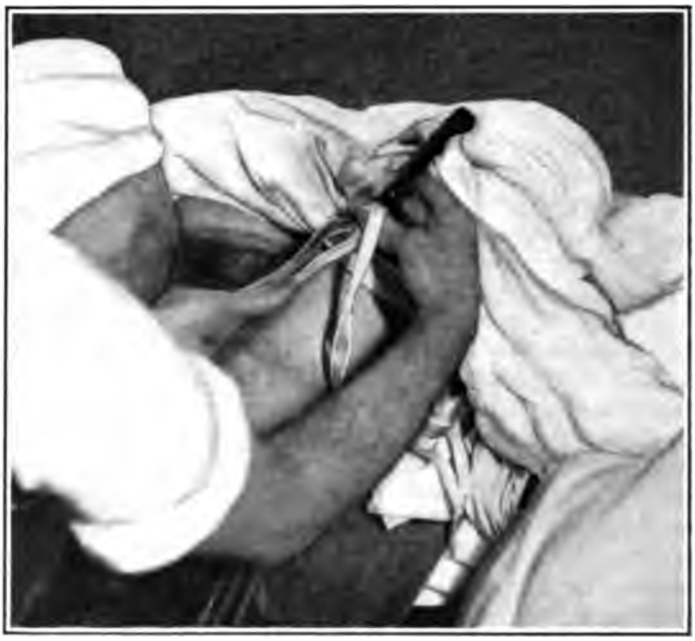
Traction with the Forceps.—Traction should be made with the pains, and if uterine contractions have ceased, it is well to rub the uterus and bring them on before making traction with the forceps. In simple cases in which the head has descended and rotated, traction

FIG. 182.



Delivery by forceps; inserting the second or right blade. (From original drawing.)

FIG. 183.



Inserting the second or right blade. (From photograph.)

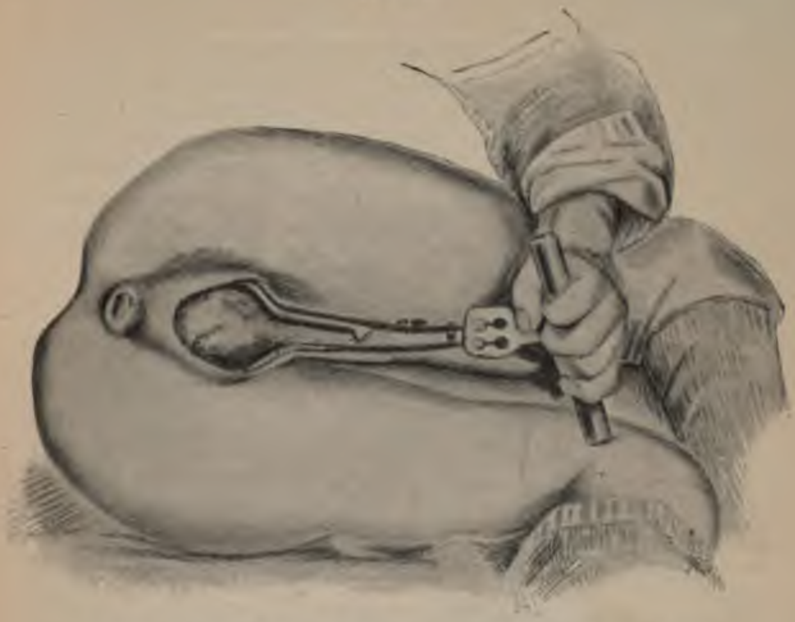
placed in a sterilizer and thoroughly boiled in 1 per cent. solution of lysol. Chromicized catgut and silkworm gut with good quality of silk for tying the umbilical cord are required. Iodoform gauze strips four inches wide and several yards long should be in readiness in sterile bottles. Aseptic ergot for hypodermatic use should be at hand, and also a hypodermic syringe containing 1-15 gr. of strychnia and 1-150 of atropia in solution. As the head may press upon the urethra and partially occlude it, it may be difficult to use the ordinary soft rubber catheter. English catheters are better for this purpose. A child's bath tub, with hot and cold water, and brandy or whiskey should also be in readiness.

The operator and nurses or assistants should thoroughly antisepticize the hands by any efficient method preferred. The operator and the nurse or assistant who handles his instruments should wear sterile operating gowns covering the clothing. A plentiful supply of 1 per cent. lysol at a temperature of 110° F. should be in readiness, and also sterile normal salt solution or boiled water. A fountain syringe, which has been boiled, should be at hand, to which can be attached, if necessary, the glass douche tube sterilized with the other instruments. The operator may wear rubber gloves during the entire operation, or, as some prefer, he may conduct the delivery by forceps without gloves, but use one glove upon the hand which delivers the placenta if he is obliged to insert the hand within the uterus. When the patient is anæsthetized and has been placed upon the table, she should be catheterized and the thighs and abdomen should be covered by sterile linen. Sterile towels should also be placed upon the bed beneath the patient. A plentiful supply of sterile cotton sponges in bichloride solution of 1 : 2,000 should also be in readiness.

Position of the Patient.—It is usual to place the patient on her back at the edge of a bed or table. Where, however, it is necessary to apply the forceps high in the pelvis it is sometimes advantageous to turn the patient upon her side, as the operator can then make traction better downward and backward. If assistants are present, they must support the limbs, which are flexed upon the pelvis. If there are few helpers, the limbs may be kept up by a sheet around the patient's shoulders, or they may be placed in chairs. When the patient is sufficiently anæsthetized, the physician should introduce all the fingers of the antiseptic hand with which he proposes to make an examination, using sufficient of the hand to palpate the head distinctly. He must study carefully its position and degree of engagement and whether the head seems of unusual size and hardness.

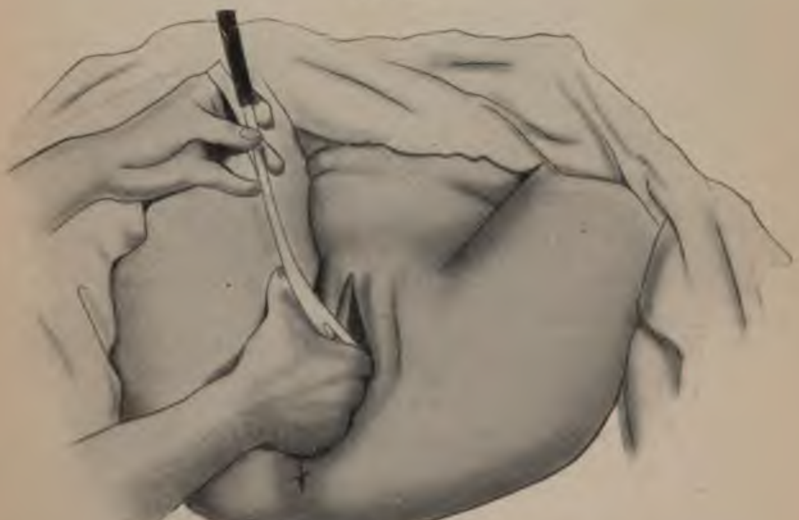
Application of Forceps.—In the simplest cases, in which rotation has occurred, while the head remains upon the pelvic floor, the forceps is to be applied straight in the pelvis, the blades upon the sides of the child's head. Before applying the instrument the physician must introduce the right hand sufficiently far so that the hand is hidden in the vagina as far as the thumb. The right hand should pass to the left side of the mother's pelvis, between the head and the pelvis. The

FIG. 179.



Head on perineum, forceps delivery, patient on her right side. (HART.)

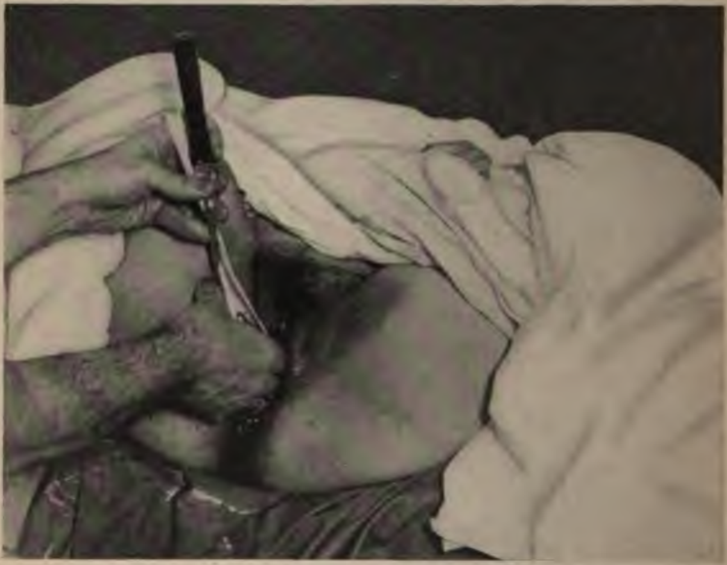
FIG. 180.



Delivery by forceps; application of the first or left blade. (From original drawing.)

left blade of the forceps must then be grasped about its middle by the left hand of the physician, in such a manner that it balances easily in the hand. The blade should then be held parallel to Poupart's ligament of the right side, the cephalic portion of the blade passing along the concavity of the right hand of the operator. The lower border of the cephalic portion of the blade should ride upon the thumb of the right hand and may be guided by the thumb. If the blade is skillfully applied, by simply dropping the handle, it will glide easily to its place. The left hand of the operator should then be inserted upon the right side of the mother's pelvis, the right blade grasped by the right hand of the operator, held parallel to Poupart's ligament of the left side, and inserted in the manner described. During the insertion of the right blade it will be necessary to depress the handle of the left blade to give the operator room. When the blade has been inserted a careful examination should be made to be sure that the blades are grasping only the head. The forceps should lock easily, and if this is not the case they have not been applied to the sides of the head. Should this occur, the blades must be unlocked and slightly shifted until it is found that they have been properly applied.

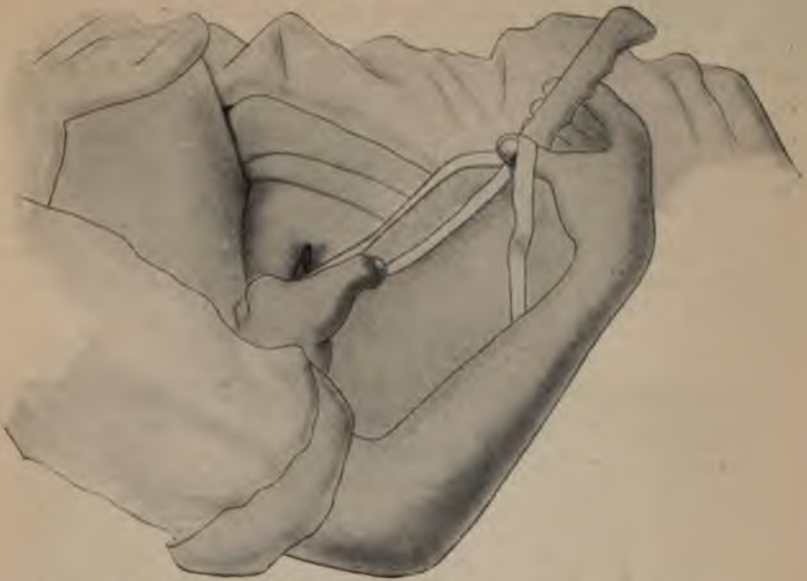
FIG. 181.



Application of left blade. (From photograph.)

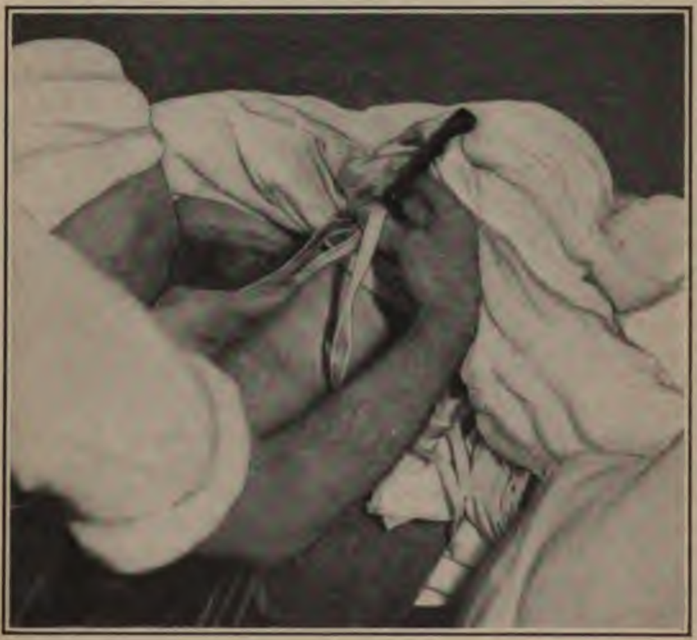
Traction with the Forceps.—Traction should be made with the pains, and if uterine contractions have ceased, it is well to rub the uterus and bring them on before making traction with the forceps. In simple cases in which the head has descended and rotated, traction

FIG. 182.



Delivery by forceps; inserting the second or right blade. (From original drawing.)

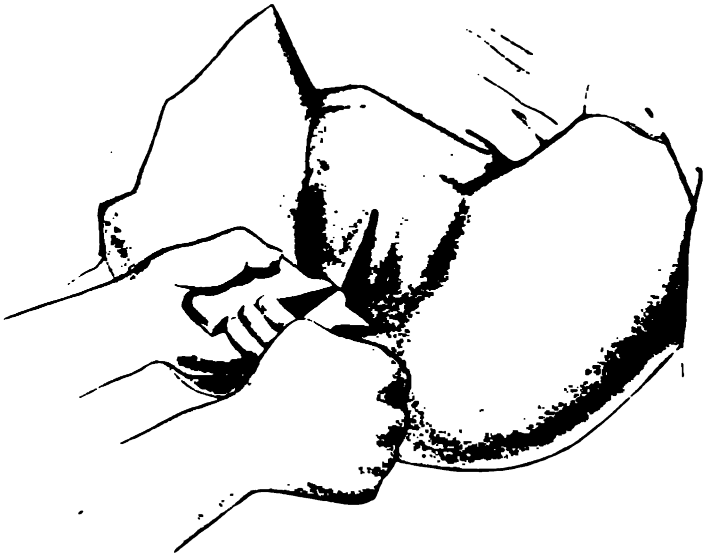
FIG. 183.



Inserting the second or right blade. (From photograph.)

should be made downward and backward until the occiput begins to appear beneath the pubic arch. When the vertex is well within the vulva the head should be cautiously raised, so that the face of the child passes over the perineum. If the operator observes that a tear of the perineum is inevitable, it may often be prevented by episiotomy. It is sometimes well to remove the instrument when the vertex has been brought well within the vulva. By rubbing the uterus and pressing downward upon the fundus it is often possible to secure the expulsion of the child without the forceps. Unless, however, every condition is favorable for such a birth, it is best to retain the forceps upon the head and to complete the birth of the head with instruments.

Fig. 184.

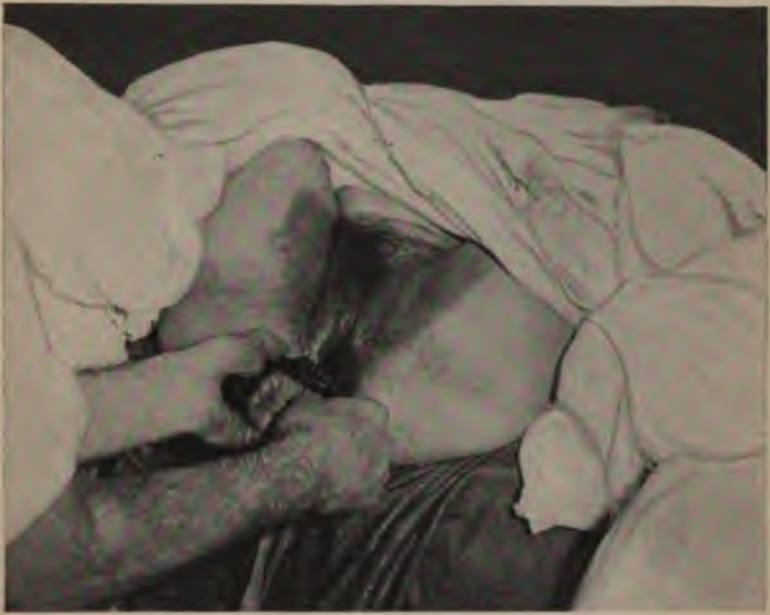


Delivery by forceps; locking the forceps. (From original drawing.)

Some operators think that less danger of laceration exists if the head is expelled spontaneously from the vagina and pelvic floor. More time is given for the parts to dilate if spontaneous expulsion is awaited, and thus the normal mechanism of labor is more closely imitated. If, however, the fœtal heart-sounds have been very rapid or slower than is normal, if the birth has been prolonged, and if the child has been delayed for some time in the birth-canal of the mother, the danger to the fœtus will be much less if the head is extracted with forceps. The mother is better protected also by forceps delivery, because less danger of relaxation of the uterus and post-partum bleeding exists. Complete flexion is better maintained with forceps than without, while the mechanism of dilatation can be secured more perfectly with the instrument than by waiting for the imperfect uterine contractions of an exhausted patient in delayed labor. Unless the prospects are good for very speedy expulsion of the child, the safer plan is to complete the labor with the forceps.

Mortality and Morbidity of Simple Forceps Operations.—The mortality for mothers and children in forceps deliveries, where the head is upon the pelvic floor and has rotated, under antiseptic precautions is practically *nil*. Delivery may have been delayed so long that the child may have perished from asphyxia before the forceps were applied, but in such a case the use of the instrument cannot be blamed for the death of the child. The morbidity of these cases for the mother consists in the lacerations which the haste and careless use of the instrument may cause. Should these tears become infected, puerperal sepsis may produce a high rate of morbidity. If reasonable care be exercised in applying the forceps, the child should not be injured in these cases.

FIG. 185.

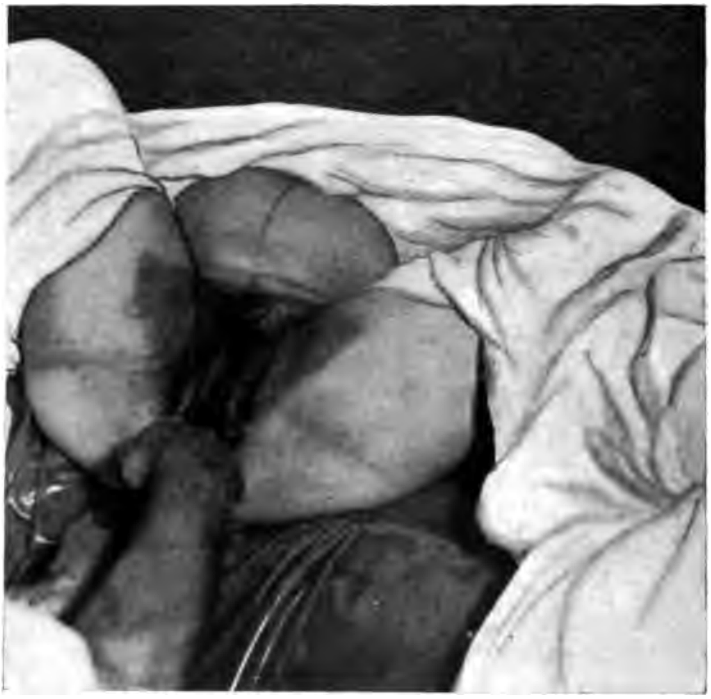


Locking the forceps. (From photograph.)

If the instrument be not applied to the sides of the child's head, and if the head be strongly compressed, intracranial hemorrhage may follow with fatal result.

Forceps in Cases of Deficient Descent and Rotation (the High Application).—The use of forceps is also demanded in cases in which the head has entered the pelvic brim, but has ceased to descend upon the pelvic floor. These cases are often seen in poorly developed primiparæ whose muscular and nervous strength becomes exhausted early in the second stage of labor. In these patients the head stands obliquely in the pelvis, usually occupying with its occipito-frontal diameter the right oblique diameter of the pelvis. It is evident that the forceps must be applied obliquely in the pelvis to fit accurately upon the child's head. In deciding to apply forceps care must be taken to make a positive diagnosis regarding the position of the head. It is well to prepare the forceps for use and to anæsthetize the patient completely with ether. A thorough examination should then be made, and sufficient of the hand introduced to palpate the head clearly. If it be found that the head has passed the pelvic brim, but remains obliquely above the pelvic floor, the forceps should be applied to the sides of the child's head, flexion maintained by axis-traction, and delivery effected by allowing the head and the forceps to rotate together upon the pelvic floor.

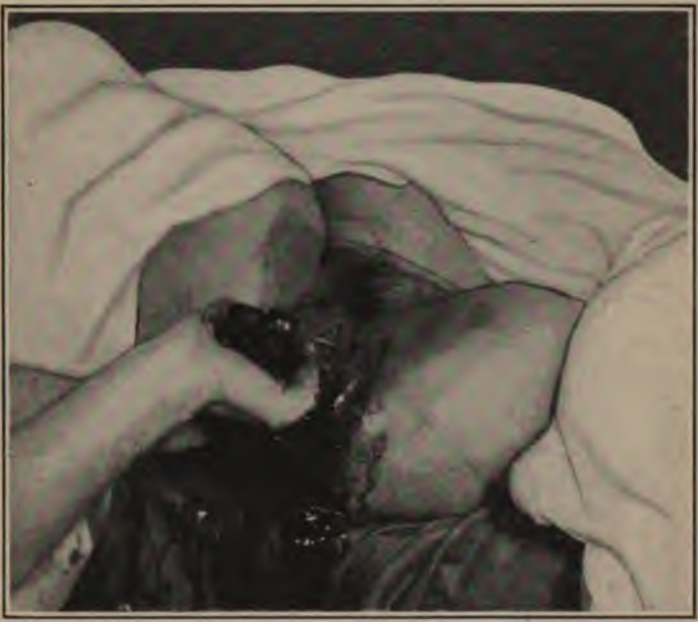
FIG. 186.



Traction downward and backward. (From photograph.)

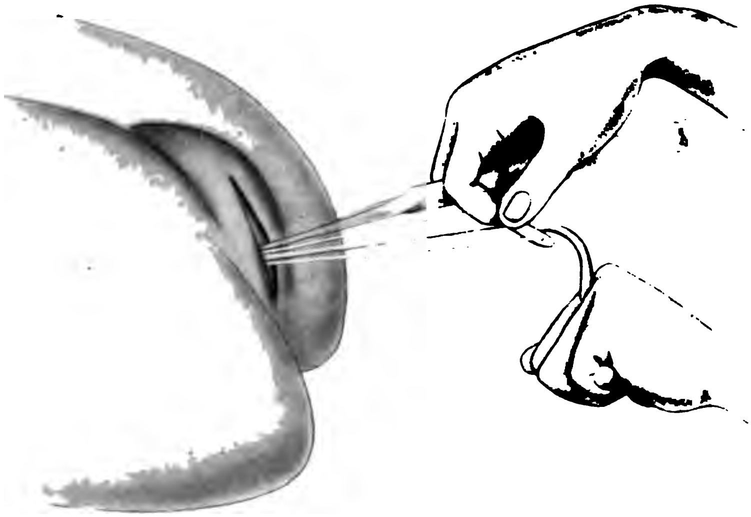
None but axis-traction forceps are suitable for delivery in these cases. The forceps are sterilized, as already described, and the patient brought to the edge of the bed or table with her hips projecting over the edge. The operator should be free to pass the hand upward and backward, and this requires that the elbow be dropped. The patient's hips should project sufficiently over the bed or table to allow this to take place readily. The right hand should first be introduced and passed sufficiently high to palpate the head thoroughly. The left blade of the forceps should be first inserted, entering the vagina with its antero-posterior diameter corresponding with the antero-posterior diameter of the vulva, and as the blade is carried higher it should be rotated gently to fit upon the child's head. In the most usual cases, that of delay in labor with the occiput presenting in the first position before rotation has occurred, the left blade of the forceps will rotate in such a manner that the anterior surface of the lock will point obliquely upward and outward toward the inner aspect of the mother's left thigh. When this blade has been introduced it should be held in its proper position and the handle gently depressed to make room for the introduction of the right blade. It is more difficult to introduce the right blade, and greater patience and time are usually required. It should be introduced first from the left, and made to rotate gently from left to right until it passes over the side of the child's head and locks with the left blade. It is often necessary to spend several minutes in carefully adjusting the forceps in locking. Unless the forceps locks easily and smoothly, the blades are not applied accurately to the sides of the head and traction cannot be

FIG. 187.



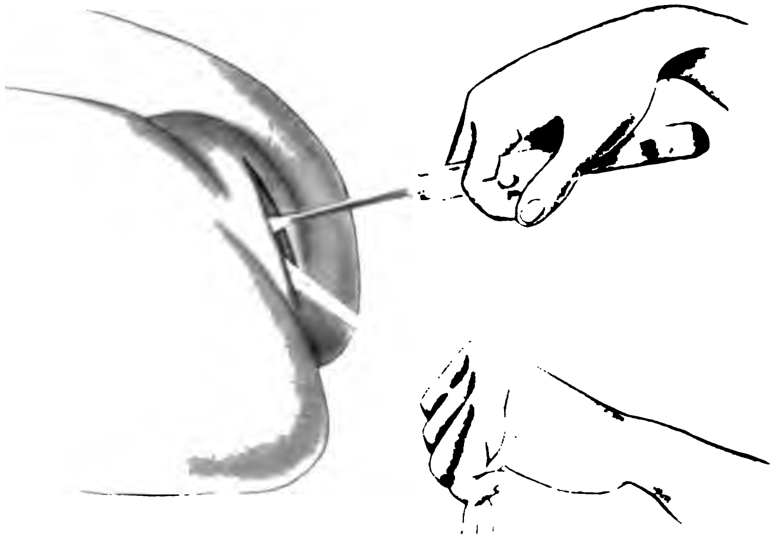
Raising the head by forceps. (From photograph.)

FIG. 188.



Delivery by forceps; axis-traction by tapes and handle bar. (From original drawing.)

FIG. 189.

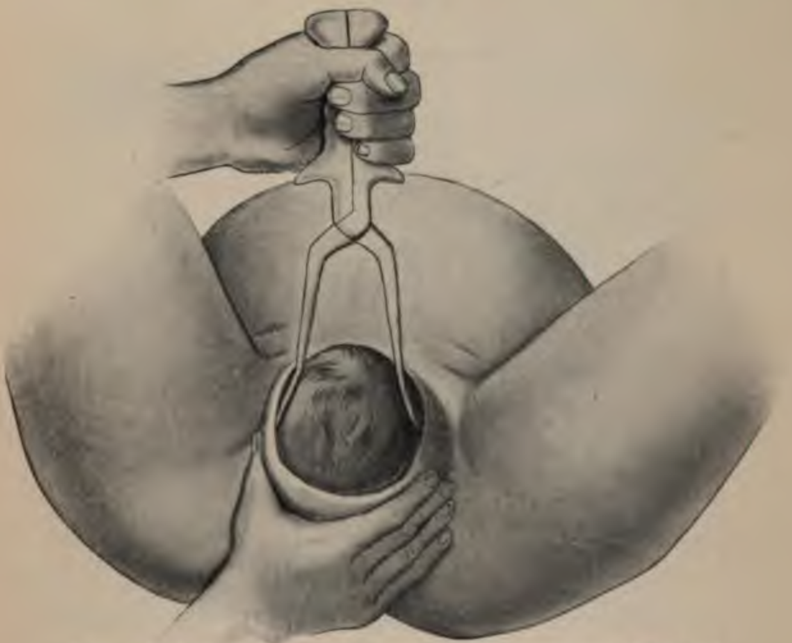


Delivery by forceps, making axis-traction with the tapes without the traction bar. (From original drawing.)

made without injury. If the blades are not locked, one may be withdrawn a little, and one or both should be rotated slightly until locking can be readily accomplished.

Axis-Traction.—When the blades have been locked the operator should carefully pass the fingers around the forceps, between the blades and the cervix, to ascertain positively that the forceps has not been applied upon the cervix. In making traction, in cases where the head has not descended to the pelvic floor and rotated, no effort should be made to rotate the head directly with the forceps. If traction be made downward and backward and toward the centre of the pelvic cavity, the head and the forceps will descend and rotate in the manner desired. If Simpson's forceps be used, it is well during the descent of the head, to relax the grasp of the blades from time to time, to prevent injurious pressure upon the head. It was formerly advised that forceps be used as a lever to pry the head from its oblique position. It was sought to accomplish the same object by traction from side to side upon the forceps after the manner of a pendulum. It was also advised in some cases to rotate the head forcibly by turning it in the grasp of the forceps. These procedures, however, have been entirely abandoned by good operators since the use of axis-traction forceps has become thoroughly understood and widely prac-

FIG. 190.

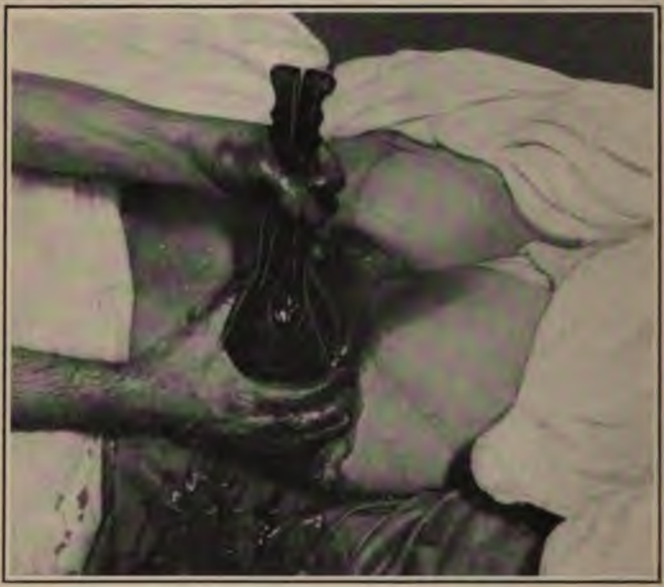


Delivery by forceps, protecting the perineum during extraction of the head. (From original drawing.)

tised. The operator should remember that he must not expect delivery to take place so readily as when the head was upon the pelvic floor. If flexion is not complete, it will require several tractions to establish this condition, so necessary for delivery. It is much better to practise gentle traction for some time, allowing the head to mould and the birth-canal to dilate, than to extract the head by sudden and forcible delivery. If the patient be under ether and in good hands, there will be less danger of post-partum bleeding and relaxation of the uterus if she be delivered without haste.

Stimulation of the Uterus During Forceps Delivery.—In prolonged deliveries with forceps it is very important that the uterus, as it grows smaller by the gradual expulsion of the child, should be followed down in the abdomen by the hand of the operator or an assistant. Before traction is made with the forceps the uterus should be gently rubbed to bring about at least a tonic condition of the uterine muscle. Pressure should be made upon the fundus during traction with the forceps, and absolute relaxation of the uterus should be, if possible, prevented. The passage of the head through the pelvis will be considerably aided by this procedure, and especially the engagement and descent of the shoulders, which are considerably under the control of the operator by external manipulation.

FIG. 191.

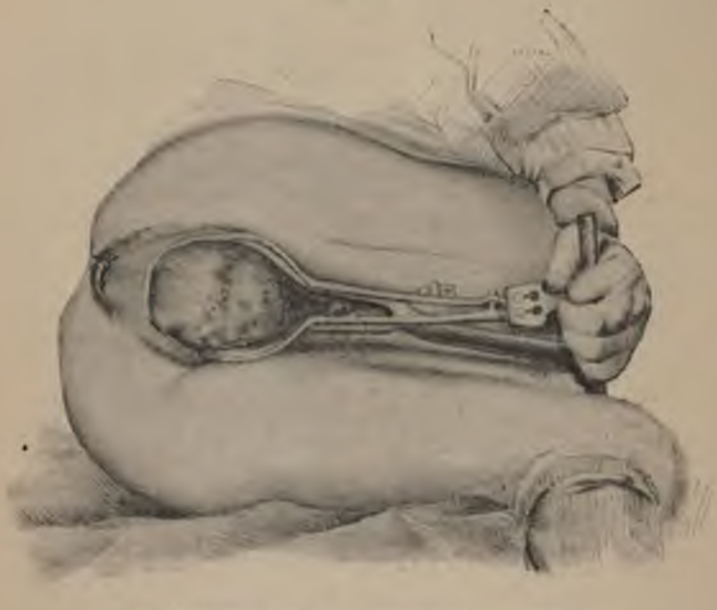


Extracting the head by forceps. (From photograph.)

In cases where the womb is kept suitably contracted during forceps delivery the placenta is often expelled at the moment of birth or is found in the vagina immediately after.

Relaxation and Hemorrhage.—One of the greatest dangers in these cases is from relaxation of the uterus and post-partum bleeding. This can be prevented by making traction with labor-pains, by not emptying the uterus rapidly, and by the prompt administration of ergot and strychnine. As soon as the uterus is emptied, if laceration occurs, the parts should be sutured in the manner already described. It should be remembered that in these cases there is also the danger of secondary relaxation and post-partum bleeding. If the patient is not in the hands of a competent nurse, a physician should remain with her or should see her again in a few hours after labor, unless there should be that most important sign of uterine relaxation and bleeding, which is found in the rapidity and feebleness of the pulse, when he must not leave until all danger has passed. It is possible for a large clot to form in the cervix and effectually dam up the cervical canal so that no blood may escape through the vagina. If the abdominal binder has been applied, it is not so easy to determine the size of the uterus; and as no blood escapes through the vagina in such a case, the patient may suffer severe internal hemorrhage with relaxation of the uterus, when the only appreciable sign of this condition is to be found in the rapidity of the pulse. The nurse or attendant should be carefully instructed, after cases of prolonged

FIG. 192.

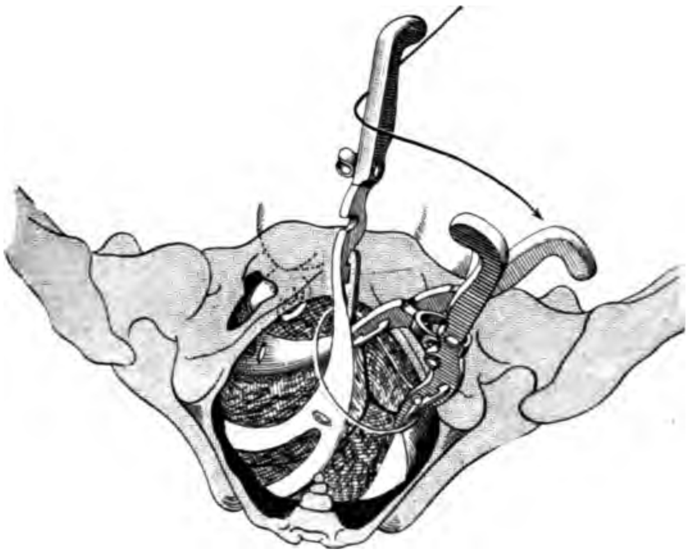


Head distending perineum, forceps delivery. (HART.)

delivery by forceps in weak patients, to look out for relaxation and hemorrhage, and, if the pulse be carefully watched and no abdominal binder be applied for the first twenty-four hours, but the womb kept well contracted by massage, these dangers may be avoided.

Delivery of the Placenta and Prevention of Hemorrhage in Forceps Cases.—Wherever possible the placenta should be delivered by the contractions of the uterus aided by compression in Crède's method. Should partial separation of the placenta occur with hemorrhage, the operator should not wait for the expulsion of the placenta, but, covering one hand with a sterile rubber glove, should insert the hand and remove the placenta and membranes. This should be done gently, but quickly and thoroughly. The uterus should be freely irrigated with hot sterile lysol 1 per cent. or normal salt solution, and should be immediately tamponed with gauze containing iodoform 10 per cent. Strychnia and ergot should be given hypodermatically and atropin and other stimulants if necessary. Relaxation and bleeding accompanying delivery by forceps are rare if these precautions are taken.

FIG. 193.



Rotation of right blade in oblique application. (FARABOEUF and VARNIER.)

Without thorough antiseptic precautions, manual removal of the placenta is a most dangerous, and may be for the patient a deadly thing, hence the utmost caution is necessary to safely perform this manipulation. After the gauze has been inserted in the uterus, the cervix should be inspected to determine the existence of tears requiring suture. If considerable laceration is present with oozing, the tears in the cervix should immediately be closed by chromicized catgut.

Mortality and Morbidity of the High Application of the Forceps.—The application of the forceps to the head situated at the upper portion of the pelvic cavity is sometimes termed the high application of the forceps. It requires more skill and patience to apply the instrument successfully and to effect delivery than is needed when the head is upon the pelvic floor. If suitable instruments be used and thorough antisepsis be practised, the mortality rate for mothers is not increased by this method of delivery. More children are lost than when the head is lower in the pelvis, because the danger of pressure is greater through the prolonged application of the instrument and the oblique position of the head. The morbidity-rate of oblique forceps application is considerable for the mother if she be in unskillful hands. Laceration of the cervix often results from too hasty delivery in these cases. The pelvic floor and perineum may also be torn. If axis-traction be not practised, the cervix may be bruised by forcing it against the pubic bone. The child may sustain severe injury through long-continued pressure, while in unskillful applications, where the blades are brought forcibly together, the scalp may be bruised by the instrument; in unskillful hands the skull has been fractured.

Application of the Forceps to the Sides of the Pelvis.—The practitioner will occasionally meet with cases in which the head has partially rotated, but in which it is impossible to fit the forceps accurately upon the sides of the head. If, with the patient under anæsthesia, he fails to apply the blades to the sides of the head, Simpson's forceps may be introduced and applied to the sides of the pelvis without regard to the position of the head. If gentle traction be made and the grasp of the forceps be relaxed between each traction, the head will gradually rotate within the forceps' blades and the instrument will gradually come to fit accurately upon the sides of the head. The blades must not be locked closely, but just sufficiently to prevent them from slipping off from the head. Axis-traction is imperative, as the object desired will not be obtained unless this be practised. This procedure, unless carefully conducted, exposes the fœtus to greater danger from pressure, because the blades grasp the head irregularly and are not fitted accurately to the sides of the head.

If, however, patience and gentleness in this use of the forceps are employed, the result is a very successful one for mother and child.

Cases in which the Forceps Should Not be Used.—In cases where the head has not entered the brim of the pelvis and cannot be made to enter by suprapubic pressure, supplemented by suitable posture, the application of the forceps is positively contraindicated. In face presentation when the chin is turned posteriorly into the hollow of the sacrum, the use of the forceps is usually contraindicated. In hydrocephalus, the forceps must not be used, as the instrument will not hold, and, slipping away, may severely injure the mother. In transverse position, shoulder presentation, the use of forceps is impossible. In presentations of the parietal bone with impaction the operator may mistake the condition present for presentation of the vertex with partial engagement. This error is a serious one, for the use of forceps is not indicated in presentation of the parietal bone, and damage to mother and child will certainly follow the attempt. The forceps should not be applied unless the membranes have ruptured or have been ruptured, and unless the cervix is completely dilated or so nearly opened that the head can pass through without doing serious injury.

Forceps in Deficient Rotation of the Occiput.—The use of the forceps in cases of defective rotation of the occiput, in which the cervix tends to rotate posteriorly, is usually conducted most successfully when Simpson's forceps is applied to the sides of the pelvis and axis-traction practised, the blades being relaxed between each traction. If care and patience be exercised, the mortality and morbidity rate for the mother and child are not increased by the use of the instrument in these cases. Its function, however, is that of traction only.

Rotation is effected in these cases not alone by the forceps, but principally by the pelvic floor and the walls of the pelvic cavity. The function of the forceps is to make traction only, interrupting this traction and allowing the head gradually to accommodate itself to the birth-canal. Rotation in these cases is very gradually accomplished, and is frequently not complete until the head has come down into the pelvic floor and has remained there for some time. In cases where the pelvic floor is deficient in strength and elasticity rotation may be delayed until the head reaches the bottom of the pelvic cavity and enters the vagina.

Forceps in Face Presentation.—The use of the forceps in face presentations is rare.

Rotation by Forceps.—Some operators prefer to rotate the head by the forceps when it descends upon the pelvic floor and rotation fails. For this purpose, forceps with narrow, solid blades are most suitable. This should be applied to the sides of the child's head, and with the patient under complete anæsthesia, the head should be gently rotated so that the occiput comes in front of the median line of the pelvis. With axis-traction, the head may be brought deeply against the pelvic floor and its permanent rotation thus secured. It is sometimes best to remove the rotating forceps after the head has turned and to apply other forceps to complete delivery. It is occasionally necessary to apply a narrow-bladed instrument to the sides of the face, bringing the chin down upon the pelvic floor. Axis-traction is a positive necessity in this case, as otherwise the chin may partially ascend and the head become impacted.

Forceps in Breech Presentation.—The application of the forceps to the breech, while not commonly practised, is a useful expedient and not injurious to mother or child. The blades should be so applied that the centre of the fenestra of each blade should correspond to the centre of each trochanter. Axis-traction forceps may be clamped upon the body of the child and the forceps and the breech be made to descend together.

Forceps to Prevent Laceration.—The forceps may not infrequently be used as a valuable means of preventing laceration of the pelvic floor and perineum. Where labor-pains are strong and sudden, if the patient be anæsthetized with ether and the forceps applied, the operator can often control the head in its passage through the vulva to great advantage. By raising or lowering the handles he can produce complete flexion or extension and the parts be gradually and efficiently dilated as the head emerges.

Precautions in the Use of Forceps.—In undertaking a prolonged and difficult delivery with forceps the operator should secure the assistance of a competent person to whom the giving of an anæsthetic and the watching of the patient may be left entirely. This is most important, as deep anæsthesia and carelessness may bring on relaxation of the uterus and post-partum hemorrhage. As the child is in greater danger than normal from asphyxia, appliances for resuscitation should always be in readiness. The use of the instrument should be based entirely upon accurate knowledge and skill in manipulation. No greater force should be used than that which is exerted when the operator sits in front of his patient, without bracing himself against any object, and making traction with the arms only; it is highly dangerous for mother and child when the operator uses extreme force or when, as in some rare cases, the strength of more than one person is applied to the forceps. It has been estimated that a force of fifty pounds weight may be applied in pulling upon the forceps without injury in average cases. This approximates very nearly the force exercised by the operator who does not brace himself against the bed, but relies entirely upon the strength of his forearms, aided by the muscles of the back and shoulders.

In using axis-traction appliances the simplest are most satisfactory. Tapes furnish a most convenient and efficient appliance, and, if linen tape be used, there is no danger of breaking. Fresh tape should be used for each application, which insures asepsis. Complicated traction bars and rods require especial care, as they are difficult of application and hard to cleanse properly.

Injury by Forceps Delivery.—In careless, incompetent hands and in unsuitable cases the forceps has justly been described as the most fatal and bloody instrument in obstetric surgery. Hasty delivery of the presenting part through a cervix partially dilated may produce tears so extensive as to open the peritoneal cavity. The pelvic floor may be torn into the rectum, the blades may cut deeply into the anterior wall of the vagina and severe hemorrhage follow. The child's head may be so crushed by pressure with forceps that fatal cerebral hemorrhage may follow. If the child survives, permanent damage to the brain and mind may occur. An eye may be destroyed by the careless use of forceps and the external ear may be torn away. Compression of the facial nerve may cause paralysis or paresis of facial muscles. The forceps may be inserted outside the cervix and a considerable part of the cervix may be torn away by the instrument. In skillful hands, however, the forceps saves the lives of mother and child without injury to either.

Accidents in Forceps Delivery.—The forceps sometimes breaks or bends during delivery. This may arise from a deficient and weak instrument in the hands of a rough and unskillful operator. If carelessly applied or improperly made the forceps may slip from the head or breech. If considerable force is exerted, the instrument may cut the mother severely. An instrument which bends under proper use, or whose edges are so sharp as to readily cut the mother, must not be used.

CHAPTER VI.

VERSION AND EXTRACTION.

By version we understand such an alteration in the location of the fœtus that its long axis coincides more or less completely with that of the uterus: this may be accomplished, first, by external manipulation; second, by external and internal manipulation combined; and, third, by the introduction of the hand within the uterus.

Indications and Limitations.—In general, the indications for version are a transverse position of the fœtus, an unfavorable presentation of the head which renders spontaneous birth impossible, contraction of the pelvis of such a kind that the head can best pass when preceded by the body, and some condition of the mother and child which demands rapid delivery, and will not permit the delay inevitable when birth is accomplished in head presentations. We shall later compare the operation of version with other obstetric procedures, and endeavor to discriminate and to describe the positive indications for its employment.

That version, however performed, may be successful, certain conditions must be present. The amniotic liquid must be wholly or in part retained within the uterus. Spasmodic and persistent contraction of the uterine muscle, known as tetanus of the uterus, must be absent. The lower uterine segment must not be excessively distended, as shown by the complete development and high position of the contraction-ring. The necessary assistance and appliances for anæsthetizing the patient, for the thorough practise of antisepsis, and for the resuscitation of the child, must be available. To succeed in difficult cases, the operator must be thoroughly familiar with the anatomy of the birth-canal, and must be possessed of sufficient skill and strength to perform the manipulations required. Especially unfavorable conditions are experienced in cases in which the amniotic liquid has long been drained away, the uterine muscle being spasmodically contracted, the vulva and vagina narrow and rigid, the child excessive in size, and one or more fœtal limbs wedged into the pelvic brim with the trunk or head of the fœtus.

As performed in average cases, the operation carries with it no great risk to the mother; but when followed by rapid extraction of the fœtus, it exposes the mother to laceration, shock and bleeding and the child to considerable danger from birth-pressure or asphyxia. The field of version has been considerably lessened of late through the extensive use of axis-traction forceps, the practise of symphysiotomy, and the perfection of Cæsarean section. It still remains, however, a most valuable operation, and especially for the practitioner who has but limited assistance and is without the apparatus employed in the more complicated procedures.

External Version.—By external version is meant the turning of the child by external manipulation only; this may be accomplished in such a way as to bring the head to present at the pelvic brim, or to cause the head to ascend and the breech of the child to present at the pelvis. The most favorable time for this procedure is just before the commencement of active labor, or, at latest, before the amniotic liquid has in any quantity escaped.

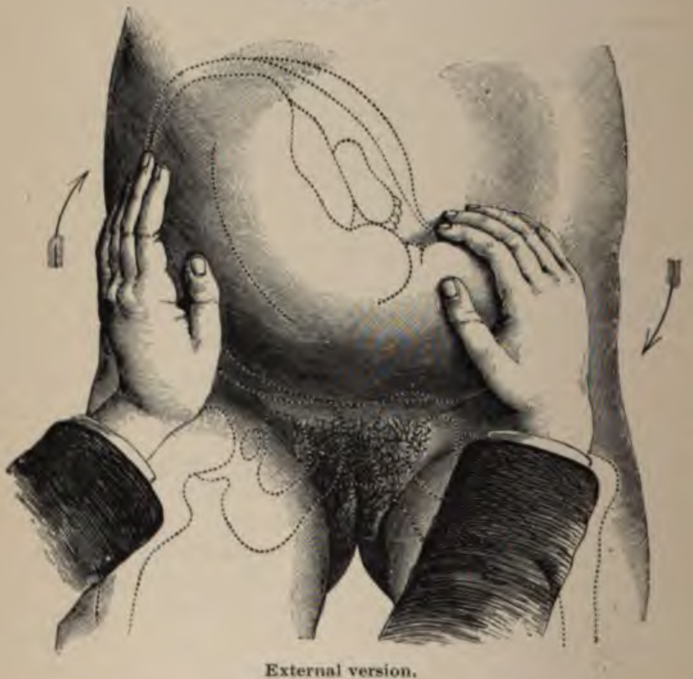
Indications.—External version is indicated in cases where a breech presentation is diagnosticated during pregnancy, or where the fœtus presents by the head, but the conditions are such that its birth in breech presentation would be more favorable for mother and child. It is also advisable in cases in which the fœtus is oblique in the uterus, the brow resting against the pelvic brim, or the occiput rotating posteriorly toward the sacrum.

External version, when performed with ordinary skill and prudence, is a harmless procedure. Only inexcusable violence can rupture the membranes, separate the placenta, or injure the mother. There is no risk of infecting the mother, as the hand is not inserted within the birth-canal. This operation, however, is performed only by those familiar with palpation, who are accustomed to diagnosticate the position and presentation of the fœtus by this method before labor begins. As the practice of palpation becomes more general and is better performed, external version should be more frequently employed.

Method.—For this manipulation the bladder and rectum should be empty. The patient is placed upon her back, her legs flexed upon the thighs, and the thighs upon the belly. The abdomen is covered by one thickness of clothing only, beneath which the hands of the operator are placed. The fœtus is carefully mapped out by percussion, supplemented by ascultation, and its position clearly defined. If it is determined to completely turn the child, that portion which is to be brought toward the mother's diaphragm is gently pushed in that direction, while the other extremity of the fœtal ovoid is carried toward the pelvic brim.

A series of gentle taps or pushes will best accomplish this purpose. Should this interference set up uterine contractions, the operator must hold the fœtus in the position gained until the womb ceases to act. If suffering results, sufficient chloroform should be inhaled to annul pain. When the fœtus is brought to its desired position it should be so held until the patient completely recovers from the anæsthetic, and it is evident that it will remain in this desired position. Should the first stage of labor be nearly completed when external version is done, the membranes may be ruptured, when the presenting part will come into the pelvic brim and the fœtus thus be fixed in the desired position. The descent of the child may be aided by suprapubic pressure, if necessary with the patient in Walcher's position.

FIG. 194.



External version.

Where it is desired to perform external version to rectify an obliquity only of the fœtus, this result is often attained most readily by carrying the head gently upward in the uterus, and then pressing the vertex downward and backward within the pelvic brim. Walcher's position is often a useful adjunct to this manipulation.

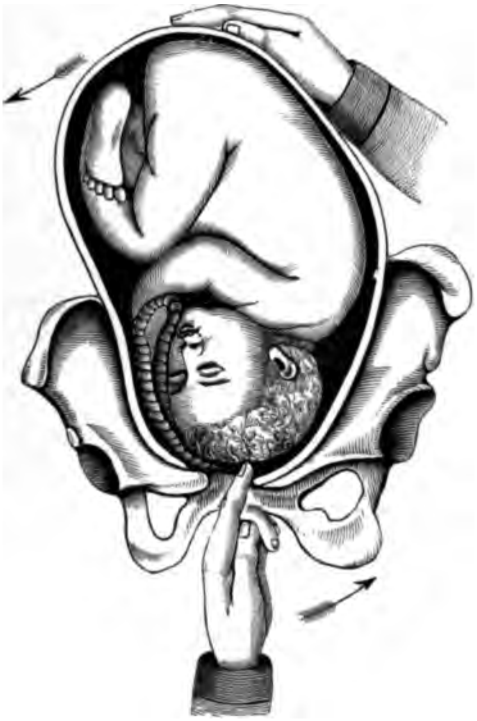
Where labor does not immediately follow the performance of external version an effort may be made to retain the fœtus in its desired position by bandaging pads upon each side of the uterus, or by applying compresses in the long axis of the womb. It is often necessary to use heavy material, so that as much weight as can comfortably be borne should be present in the compresses so applied. It is rarely possible, however, to maintain the fœtus for a considerable time in any position by this procedure, as the compression of the abdomen becomes painful to the patient, and unless labor comes on and the compresses are removed, the fœtus may return to its former location. If it is necessary to bring on labor promptly, the membranes should be ruptured.

Combined Version.—By combined version is understood the alteration of the position of the fœtus by external and internal manipulation conjointly: this is possible only when partial dilatation of the os and cervix is present, and when the patient is therefore in the first stage of labor.

Indications.—This procedure is indicated in cases where it is necessary to turn the child because of some danger which first becomes apparent when labor begins. In placenta prævia, for example, where the placenta is partially over the os, the first stage of labor may not proceed far before the physician discovers the complication which threatens. If the head is high in the pelvis and readily dislodged, he will naturally desire to bring the breech within the cervix, thereby compressing the placenta and preventing bleeding as birth proceeds. The writings of Braxton-Hicks and others have made this procedure familiar to physicians in the treatment of placenta prævia. In face presentation, in brow presentation, in cross positions, in prolapse of the cord when dilatation is but slightly advanced, combined version is often successfully employed.

Method.—Strict antiseptic precautions are imperative in this procedure. The bladder and rectum being emptied, a thorough vaginal douche of creolin (1 per cent.) or bichloride of mercury (1 : 5,000) is given. The hands and arms of the operator are thoroughly scrubbed with soap and hot water, again in hot water, and then in bichloride solution (1 : 2,000). It is usually unnecessary to employ a lubricant for the fingers; but if such be used, it should be combined with an antiseptic; creolin or lysol answers the purpose well. The patient is then brought to the edge of a bed or table, her legs and thighs flexed and suitably covered. The abdomen should be covered by one thickness of clothing only, so that the external hand of the operator may experience no difficulty. If the patient be excessively sensitive, chloroform may be employed; if she is not easily made to suffer, no anæsthetic is required. Care should be taken not to rupture the membranes, as this version is most successful when all the amniotic liquid is present. The operator introduces sufficient of his hand within the vagina to enable him to pass two or three fingers through the cervix; if this be done slowly and gently, pressing the pelvic floor downward and backward, but little resistance from the levator ani muscle will be experienced. While the fingers of the internal hand raise the part which presents at the pelvic brim, the other hand first carries this part upward into the uterus, and then, pressing alternately upon the further extremity of the fœtus, gradually turns the child. When the child is made to present by the breech the operator endeavors, if possible, to bring the fœtal legs within the pelvic brim before the breech descends. The internal hand is kept within the vagina until the version is complete, when it will grasp one foot of the child and draw it gently downward through the cervix, causing the other thigh and breech to engage. A noose of tape or bandage is then passed over the ankle, and in this manner the presenting foot remains within the vagina.

FIG. 193.



Braxton Hicks' method of combined podalic version, first stage; one or two fingers of the left hand lift the head from the brim and push it toward the left iliac fossa, while the right hand pushes the breech transversely toward the right side. (HICKS.)

It is often advantageous, if possible, not to rupture the membranes until the leg presents at the pelvic brim, when the membranes may be broken and a foot readily grasped. If, however, the membranes have already broken, this version may still be accomplished unless the uterus be firmly contracted.

Partial version by combined manipulation is often indicated. A beginning brow presentation, a presentation of the parietal bone, a beginning face presentation, or a partially posterior rotation of the occiput may often be corrected by this means. In these cases the internal hand carries the lowest point of the fœtal head upward and backward, while the external hand, having located the vertex by palpation, endeavors to bring it downward and forward within the pelvic brim. Walcher's position may be employed to advantage in these procedures. If the membranes have not ruptured, they should be broken so soon as the head is favorably situated; and should dilatation be tardy, it may be completed by artificial means.

Advantages.—Version by combined manipulation has many advantages. Under antiseptic precautions it exposes the mother to no great risk, if tetanus of the uterus be absent. It does no violence to the child, nor is there great danger by this procedure of prolapse of the cord or separation of the placenta. It is impossible in complicated presentations of the fœtus, when its limbs are wedged into the pelvis with the head or breech. Its successful performance requires patience and tact, and it has the disadvantage that it does not place the fœtus so completely in the control of the operator as does internal version. Its use has been lessened in placenta prævia by the employment of the antiseptic tampon, while it is more frequently used to rectify malpositions of the head. In many of the latter cases the greater part of the hand is inserted within the vagina, the head grasped in this way and brought within the pelvic brim.

Internal Version.—By internal version we understand the turning of the child by the insertion of the hand of the obstetrician within the uterus: this is usually podalic version, because it is ordinarily desired in these cases to bring down the feet of the child. When the fœtus has been so grasped by the obstetrician, it can readily be delivered, unless some important obstacle to birth exists in either fœtus or pelvis. Internal version is, then, one of the most rapid and effectual methods for securing delivery.

Indications.—The choice of this operation will depend primarily upon the need existing for rapid delivery. As version, next to Cæsarean section, is the quickest method of removing the fœtus, the degree of necessity existing for immediate delivery must largely determine the choice of the operation. Although the cervix must be nearly, if not completely, dilated to perform version successfully, still methods at our command for dilating the cervix are so efficient that a partially-closed cervix need not prevent the choice of version. The comparison of version with symphysiotomy and forceps will be given later, and for the present we will assume that the necessity for prompt delivery is present and that no insurmountable obstacle to the version exists. The obstetrician will readily recognize eclampsia, placenta prævia, threatened sudden maternal death, and prolapse of the cord, as indications calling for prompt delivery.

Method of Operating.—As version is a radical operation requiring the introduction of the hand within the womb, it cannot be successfully undertaken without the employment of anæsthesia and the strict practice of antiseptic precautions. Chloroform is decidedly the better anæsthetic for version, as it successfully relaxes the uterus sufficiently to allow the necessary manipulations, while the rapid recovery of the patient from its influence minimizes the risk of secondary relaxation and puerperal hemorrhage. Chloroform has also this advantage in version, that it may be conveniently administered by the operator, alone, and version performed without skilled assistance. Winckel describes this procedure, and it is commonly practised by those trained in Continental schools. Practitioners in the South and West also employ this expedient when without help.

The administration of chloroform should always be done in a careful manner; a simple device for giving the patient an abundance of air with the anæsthetic must always be used. The Esmarch mask is especially convenient for this purpose. Failing this, the operator may pour a drachm or two of chloroform upon a handkerchief, and allow the patient to hold it in the hand and herself inhale the vapor. When she is sufficiently asleep, the hand will drop from the face, and version may then be begun. It is usually necessary, however, to continue the anæsthetic until the version is completed, and hence the services of a skilled assistant are especially desirable.

A most useful antiseptic for this operation is found in creolin, or lysol; the advantage of this substance lies in its lubricant properties, whereby the employment of an ointment upon the hand is rendered unnecessary. Should the obstetrician be overtaken by an emergency and without an antiseptic, soap will be found most convenient and useful. Olive oil which has been sterilized by heating may also be employed.

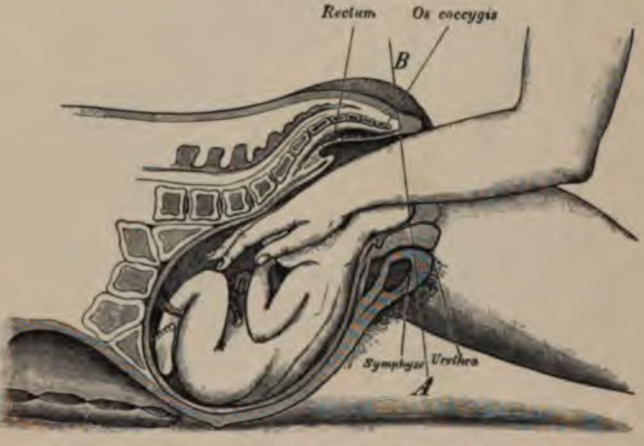
During the performance of version it may be necessary to pass a noose about one of the fœtal limbs; this is best made from soft bandage material, thoroughly soaked in an antiseptic solution.

As version must be followed in most cases by extraction, the operator should have forceps ready with which to deliver, if necessary, the after-coming head. As in cases requiring rapid extraction the birth-canal may be lacerated, suture material and necessary instruments must be ready. Abundant hot water, for intrauterine douching, and iodoform or bichloride gauze ought to be at hand.

To guard against shock and relaxation of the uterus, 1-15 gr. of strychnia should be dissolved and at hand in a hypodermic syringe. The interests of the child must not be forgotten in preparations for version and extraction. It is often born asphyxiated, and hence hot and cold water with a bath-tub, a hot blanket, materials for ligating the cord, or hæmostatic forceps for clamping it quickly, should be at hand. The child's life will be much safer if a skilled assistant be present, who can, if necessary, devote himself to it.

Posture.—The posture in which the patient shall lie during the performance of internal version varies in accordance with the usage of the operator and the circumstances of the case. American physicians commonly place the patient upon her back in the lithotomy posture. When assistants are few, the thighs and legs may be held by passing a sheet beneath the knees and around the patient's neck. The abdominal surface should be easily accessible to the hand of the operator as version proceeds; when without suitable help, many physicians do best by placing the patient upon her side, and anæsthetizing her with a cone or mask held in one hand, while the other is inserted within the womb to grasp the fœtus. The lateral posture in version has also the advantage of enabling the operator to draw the fœtus strongly downward and backward in the axis of the pelvic brim. The prone position for version has been advocated by Mensinga[183]; he claims the following advantages for this procedure: the outlet of the pelvis is directed forward and upward, giving the operator much more room for the insertion of the hand; the operator's hand and arm are also prone, affording a better use of the muscles and tactile sense. This posture widens and partially dilates the uterus and vagina, and the contraction-ring often disappears in these cases. There is less danger of bruising the soft parts. The patient has a pillow beneath the chest, and her head turned to one side, while the operator sits beside her, using either hand. Two dangers are considerably lessened, namely, tearing the uterus from the vagina and the occurrence of air-embolism. Patients suffer less pain when in this posture. Mensinga's paper upon the subject has been criticised by those who urge the employment of the lateral posture in version. Further clinical experience must decide the true value of the various postures in which operators have been accustomed to place their patients. As a rule, the dorsal lithotomy position will be most often employed.

FIG. 196.



Version with patient in prone position. (MENSINGA.)

Diagnosis of Fœtal Position.—Before the operator can intelligently proceed to perform internal version he must carefully map out the exact position of the fœtus; the bladder and rectum must be completely emptied, for a full bladder may greatly mask the position of the child, and an impacted bowel may offer a considerable obstacle to the descent of the fœtus. Percussion and ausculation are often best performed when the patient is anæsthetized, as muscular rigidity is then removed. If the head be presenting above the brim of the pelvis, the feet and legs will be found on that side of the abdomen opposite to the greater portion of the head and in its upper quadrant. If the child be transverse, the back in front, the head upon the mother's left side, the right arm and shoulder presenting, the feet will be found upon the mother's right side in the right upper quadrant of the abdomen. If the abdomen of the child be turned toward that of the mother, and its head upon her left side, the feet and legs will be found upon the mother's right side, usually below the umbilicus. If the head of the child be upon the mother's right side, the back in front and the left arm and shoulder presenting, the feet of the child will usually be found upon the mother's left side, and in the left upper quadrant of the abdomen. If the head of the fœtus be upon the mother's right side, its abdomen directed toward that of the mother, and the right arm and shoulder presenting, the feet and legs of the child will usually be found upon the left side of the mother, at or below the umbilicus. In complicated presentations the legs may

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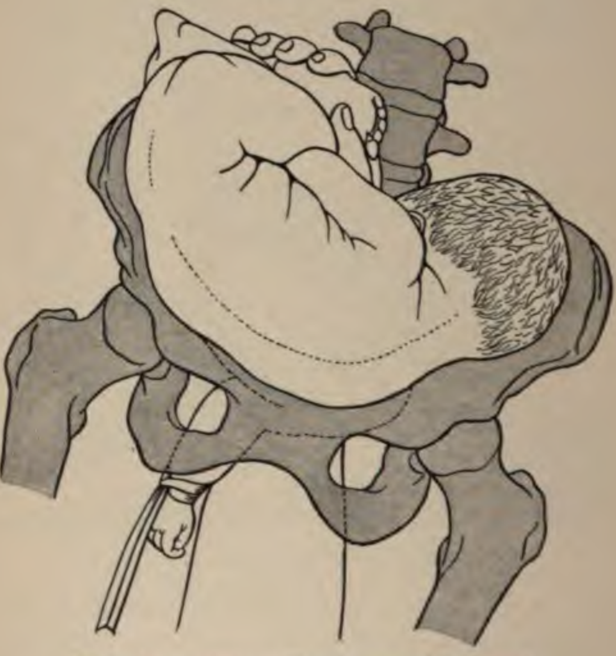
[183] Mensinga: Centralblatt für Gynäkologie, No. 23, 1896.

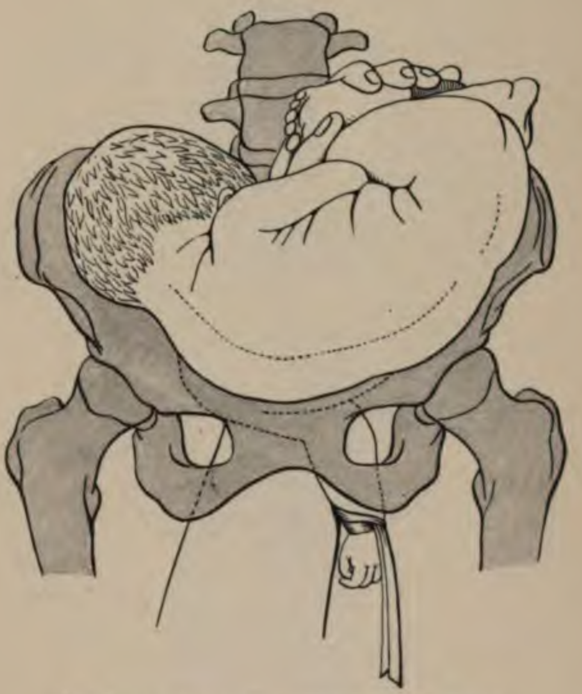
FIG. 197.



Right dorso-anterior. (FARABOEUF and VARNIER.)

be completely extended, although the thighs are flexed upon the trunk. When the head presents, the feet may be found just above the contraction-ring, if such has formed. A foot or leg is occasionally folded behind the back of the fœtus, or the fœtus may present in neglected transverse presentations in the form of a wedge at the brim of the pelvis. In these cases an arm and shoulder, and occasionally a foot and leg, may present together. These complications cannot always be distinguished by palpation; as a rule, the general position of the fœtus can be and should be ascertained by external examination before the version is undertaken.

FIG. 198.



Left dorso-anterior. (FARABOEUF and VARNIER.)

Choice of the Hand and Preparation.—Much discussion has been elicited in deciding the question, which hand of the operator should be introduced in the performance of this operation: the natural usage of the obstetrician should be considered. Few persons have equal use and equal strength in both hands; many will instinctively select the better hand for version. La Chapelle, Loviot, Charpentier and Pajot[184] would use either hand, selecting that which seems most convenient for the operator. The choice of the hand will depend somewhat upon the posture of the patient: thus, if she be upon her back, the operator sitting in front of her, he will naturally select the hand opposite the feet. If the head be presenting, and the back of the child toward the mother's left, the left hand of the operator would seem most appropriate. If the child be with its head upon the mother's left side, the left hand again would be most nearly opposite the feet. If the patient be upon her left side, the operator will usually select the right hand for version; while if she were placed in the prone position, either the right or left, in accordance with his individual peculiarity, would be chosen. Some have sought to formulate the rule that the hand should correspond to the side of the mother toward which the presenting part is directed, and while this may be correct in many cases, it is evidently not an inflexible law. Before introducing the hand the vagina should be thoroughly douched, preferably with creolin or lysol (1 per cent.). Both hands and forearms of the operator should be scrubbed with soap and hot water, again in hot water, and then in hot bichloride solution (1 : 2,000) or in creolin solution (2 per cent.). The nails should be trimmed short and made

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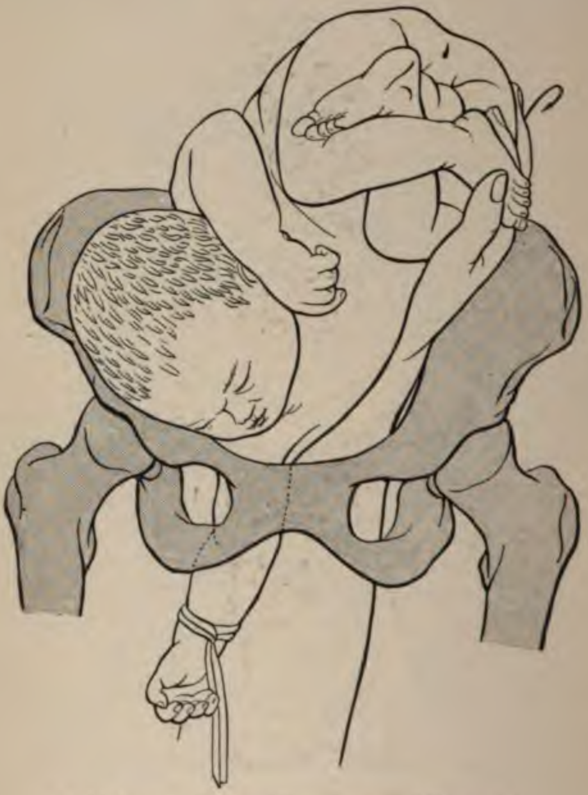
[184] Bulletin de la Société obstétricale de Paris, No. 8, 1888.

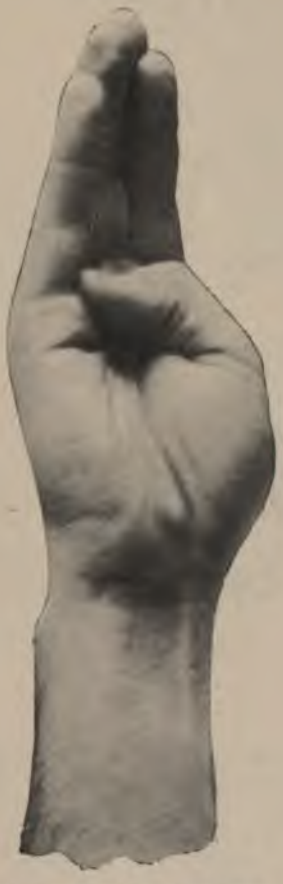
FIG. 199.



Right dorso-posterior. (FARABOEUF and VARNIER.)

smooth. Rings must be removed. It having been ascertained that dilatation is sufficiently advanced to admit the folded hand, the hand should be drawn into a cone-shape and its back, but not the palmar surface, anointed with creolin or with an antiseptic ointment. The hand should then be introduced within the vagina with its greatest axis of width parallel with the antero-posterior diameter of the vagina. The pelvic floor should be carried gently downward and backward, gradually overcoming the resistance of the sphincter of the vagina and of the pelvic floor. The fingers should seek the *os uteri*, and by a gentle motion the hand should be carried through the os and cervix and upon the fœtal body. If the head be presenting, it should be gently pushed upward to one side, while the external hand, co-operating with the internal, will assist in carrying the head out of the way. If the shoulder be presenting and be found against the pelvic brim,

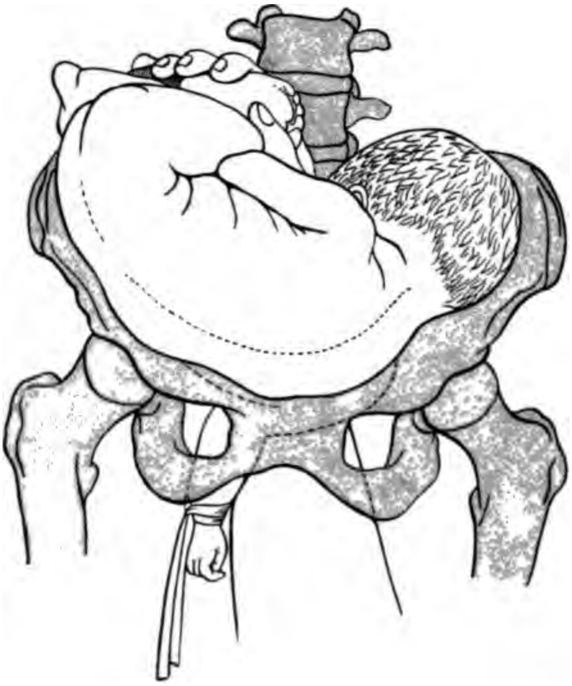
FIG. 200.



Folding the hand for version.

care must be taken to dislodge it slowly and gently. The external hand may co-operate by making counter-pressure upon the fundus of the uterus, or by gently pushing the impacted part upward, while an assistant presses upon the womb. Should uterine contractions be severe, the operator should extend the hand upon the fœtal body, and allow it to remain until the womb relaxes. Should the membranes have been found unruptured, they must, of course, be broken, when no time should be spent in pushing up the fœtus, but the hand should be carried rapidly to the fundus of the uterus and the feet and legs grasped. The forearm of the operator will thus act as a plug, preventing loss of the entire amniotic liquid.

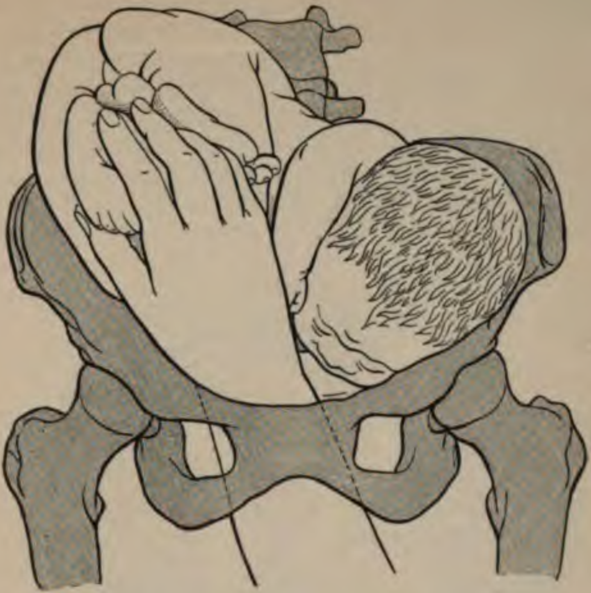
FIG. 201.



Grasping the feet. (FARABOEUF and VARNIER.)

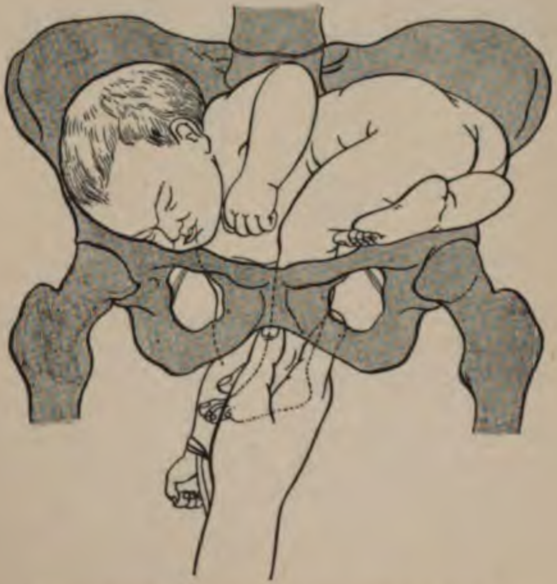
Choice of Fœtal Foot.—Which foot shall be grasped in performing version, has been a question provoking much controversy. The exigencies of a given case must in some measure settle this question. Where version must be followed by rapid extraction, both feet, if possible, should be grasped. Others urge that, in grasping a foot, it must be kept in mind that the back of the child should be brought anteriorly for its most successful extraction. Where the head is presenting and the back is to the left, the upper or right foot will best accomplish this end. In second positions of head presentation

FIG. 202.



Grasping both feet. (FARABOEUF and VARNIER.)

FIG. 203.

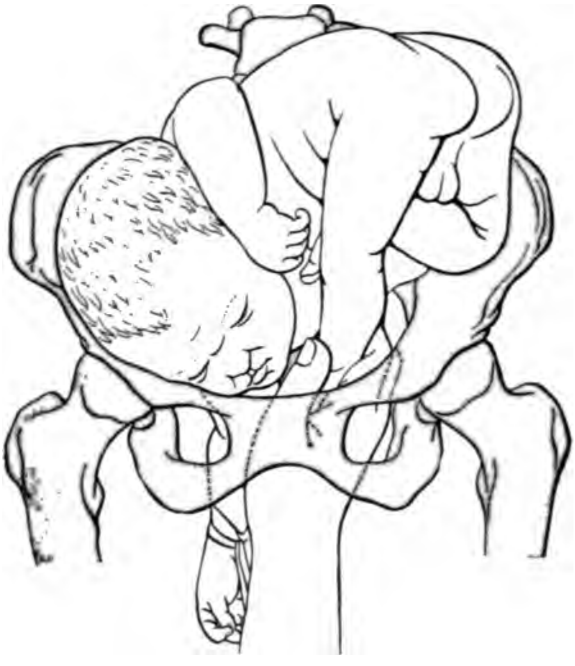


Grasping the upper foot. (FARABOEUF and VARNIER.)

the left foot will be the better; in transverse positions, the back to the front, the lower foot should be grasped; while in transverse positions, the abdomen to the front, the upper foot should be taken.

Nägel,[185] from personal experience in thirty cases and from study of the literature, concludes that it is indifferent which foot is seized; one should keep in mind the fact that the leg which is seized must be brought forward behind the symphysis, and that the performance of internal version requires more than the simple grasping of the leg and foot, but implies a gradual turning of the child's trunk so that the back shall come in front. In practise it is certainly inadvisable to waste time and effort in carefully selecting one or other foot. While the operator should carefully map out the fœtus and decide which foot he chooses to make the version, he may find it almost impossible to discriminate when the four fœtal limbs are found together, and he should then take the foot and leg most conveniently grasped and rotate the fœtus accordingly. None but the expert obstetrician will keep clearly in mind the precise mechanism of version in complicated cases, and hence practical considerations and not theoretical rules must govern us. The operator will best maintain his grasp upon the

FIG. 238.



Traction upon one leg. (FARABOEUF and VARNIER.)

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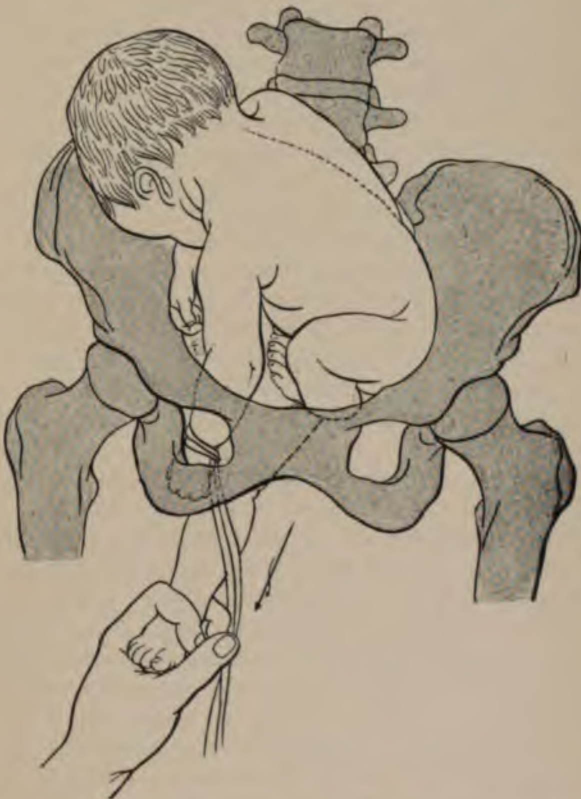
[185] Nägel: Archiv für Gynäkologie, Band 44, Heft 1, 1893.

leg and foot by taking the leg and ankle between his fingers, grasping the foot in the palm of the hand and folding the fingers and thumb over the foot. In this manner, his nails will be turned away from the wall of the uterus, and he will do least damage in making traction.

Line of Traction.—It is of great importance in version that the operator should make traction in the proper direction. This should always be done in the axis of the pelvic brim, namely, downward and backward; this necessitates a proper placing of the patient before the operation is begun, and must lead the operator to remember that obstetric operations, like those of surgery, are best done with the patient upon a suitable table. The average bed is too low and often too yielding to form a good support in operative cases. So soon as traction is begun upon the foot and leg, the external hand or the hands of an assistant should carry the opposite extremity of the fœtus gently upward and backward in the abdomen. By this combined manipulation the fœtus is gradually turned, and the foot and leg

FIG. 205.



Internal version completed. (FARABOEUF and VARNIER.)

brought within the vagina. Version is usually said to be complete when the foot presents at the vulva, and the head of the child has ascended to the fundus of the uterus.

Precautions.—Version is especially dangerous where the amniotic liquid has drained away and the uterus is in the spasmodic contraction known as uterine tetanus: the contraction-ring of Bandl will be found in these cases midway between the pubes and the umbilicus, while the head or shoulder remains in the lower uterine segment, which is excessively stretched. If this condition be pronounced, version is exceedingly dangerous, and many urge decapitation or craniotomy in these cases. If, however, the patient relaxes well under chloroform, and the contraction-ring be not strongly developed and high in the abdomen, it is often possible, with care and patience, to complete version safely. Some have found advantage, in dislodging an impacted fœtus, in placing the patient in the knee-chest posture; but the operator's chief reliance in these cases must be upon complete anæsthesia and patience and manipulative skill. In dislodging impacted presentations no specific rule can be given. The lowest part presenting must first be carried backward, then upward and forward. The wedge which fills the pelvic brim can often be broken up by a slight change in the position of one of its component parts. If the elbow be presenting, it may be either carried upward into the uterus, or the arm drawn downward, and thus the lock be loosened. If the knee be presenting with the head, it is usually possible to move the head sufficiently to enable the operator to bring down the foot. Counter-pressure upon the fundus of the uterus is especially important in these cases to prevent tearing the womb from its attachment to the vagina. If the fœtus be dead, embryotomy may be the much wiser procedure; when the hand is inserted within the uterus the obstetrician should carefully palpate the presenting parts, and especially the head, to detect the presence of hydrocephalus or of a monstrosity. It would be evidently unwise to attempt version with marked hydrocephalus, as the large head of the child would almost surely tear the lower uterine segment. Under antiseptic precautions and anæsthesia the introduction of the hand, if only for diagnosis, is so valuable a procedure that it should be employed, even if version be abandoned and some other procedure be determined upon. If a loop of cord be prolapsed, it should be grasped in the fingers and carried upward, if possible, above the brim of the pelvis, and placed at one or other sides of the promontory of the sacrum. The question of the life or death of the fœtus is best determined by feeling the presence or absence of pulsation in its cord.

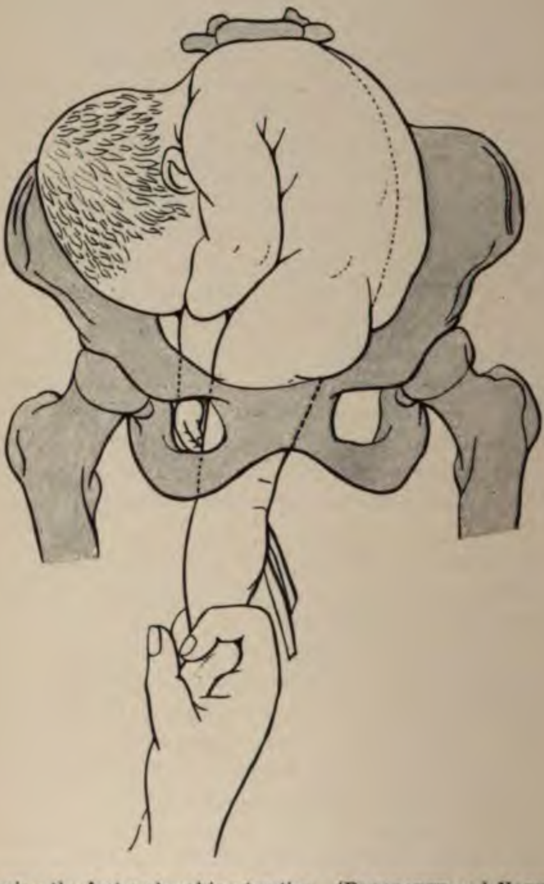
The Completion of Delivery After Version.—Although, technically, version may be regarded as complete when the child has been turned within the womb, yet, in the exigencies of practice, the operator usually proceeds directly to complete the delivery. When version is cephalic, the head being brought to the brim of the pelvis, it is evident that further delivery is to be accomplished, if not spontaneously, by the use of forceps. Version, however, does not cause the head necessarily to engage, and without at least a partial engagement the forceps cannot be used: hence cephalic version must be followed by the adjustment of the fœtal head to the pelvis.

To accomplish this, the operator must remember that the oblique diameters of the pelvic brim are well considered the working diameters of the pelvis. He must further recall the fact that the head will not engage unless flexion or complete extension is present; of these, flexion is always desirable and rarely impossible. When cephalic version is complete the operator should introduce, under surgical anæsthesia, the entire hand within the vagina, and, palpating the head, should push up the chin of the fœtus while his external hand by suprapubic pressure causes the occiput to descend; this procedure should be done deliberately, but thoroughly, the hand being retained within the cervix until at least a partial engagement of the head is assured. If the forceps is then ready, one blade may be passed along the internal hand before it is withdrawn, the other blade immediately following, and extraction may proceed forthwith. Should the operator find that extension has occurred, and that he cannot produce flexion without undue violence to the uterus, he is confronted with two alternatives: one, to make extension complete, allowing the labor to proceed as a face presentation; the other, to relax the uterine muscle by deep anæsthesia, to make podalic version, and immediate delivery. His choice of these alternatives must depend upon the degree of spasmodic contraction of the uterus which is present, the stage of descent of the fœtal head, and the size of the child. Fortunately this condition is a rare one, and cephalic version usually leaves the head with the vertex presenting.

In many cases the complete engagement of the head after cephalic version is greatly furthered by putting the patient in Walcher's position. In practising suprapubic pressure in these cases it is especially important that the bladder be completely emptied by catheter before this manipulation is undertaken. The further consideration of extraction following cephalic version will properly be considered elsewhere.

Extraction.—Extraction after podalic version may be rapid or deliberate, in accordance with the exigencies of the case. Where the placenta has become separated and active hemorrhage is going on, where the mother is in eclampsia, or where the mother has just died and the operator chooses version and extraction to remove the fœtus, the child must necessarily be taken from the mother's body as rapidly as possible. This, of course, exposes it to great risk of death through asphyxia from pressure, prolapse of the cord, fracture of the cranium, fracture of the clavicle, or inspiration of blood and amniotic liquid. In performing rapid extraction, if the operator has brought down but one leg, he should pull strongly downward and backward upon this, the patient being upon the edge of a high table, until the second leg can be grasped. If the second leg be extended upon the body of the child, the child's trunk should be rotated into one of the oblique diameters of the pelvic brim, the fingers of the operator passed along the thigh upon its posterior surface, and an effort made to flex it across the abdominal surface of the infant's trunk. Force applied near the knee-joint is usually most successful, as it flexes the leg and thigh in addition. The leg and ankle can thus be brought within the grasp of the operator, and brought down. The fœtus should be prevented from ascending into the uterus by a noose of bandage or tape passed about the ankle of the leg already secured. In rare cases, fracture of the femur occurs during this manipulation; but if haste is imperative, this accident becomes of secondary importance.

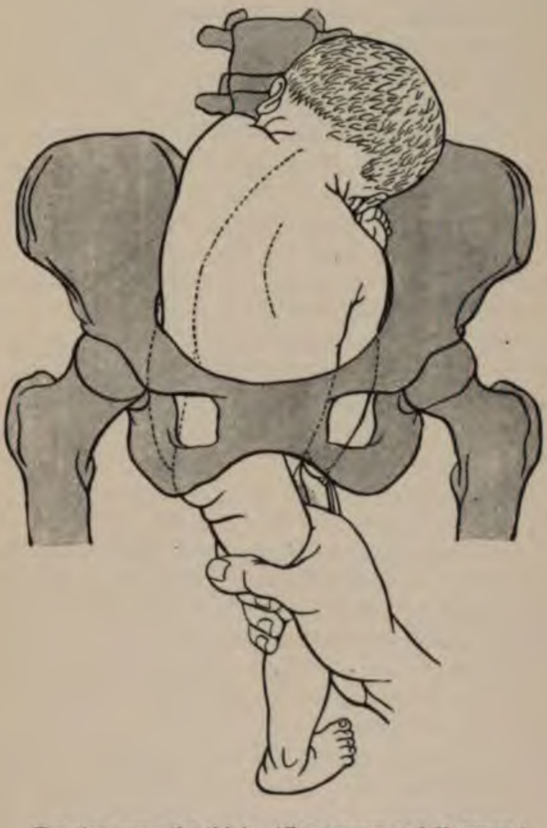
FIG. 206.



Grasping the foot and making traction. (FARABOEUF and VARNIER.)

When both legs have been secured, the trunk of the fœtus should be rotated completely into an oblique diameter of the brim. Wrapping the thighs in a towel, the operator should grasp them firmly, making traction downward and backward, while his other hand should be laid broadly behind the pubes, carrying the head down within the pelvic brim, and, if possible, maintaining partial flexion. So soon as the body has descended to the axillæ strong traction downward and backward should be made upon the trunk, followed by raising the trunk strongly upward and outward, still maintaining it in an oblique position with regard to the mother's pelvis. This simple manœuvre will usually bring the lower arm through the cervix and upon the pelvic floor. The hand of the operator, in grasping the legs, should then be passed along the child's back to the shoulder, and the lower arm brought down. Force should be applied at the humerus just above the condyles, as fracture is thus best avoided and flexion of the forearm secured. The operator must then quickly change hands, grasping the legs of the fœtus with the other hand, and carrying the legs and pelvis of the child strongly upward and outward to the side opposite the shoulder

FIG. 207.



Traction upon the thigh. (FARABOEUF and VARNIER.)

which it is desired to bring down. The free hand passed along the back will usually be able to reach the arm without special difficulty.

The fœtus is thus extracted rapidly with but trifling injury. If strong traction has been made in this manœuvre, accompanied by suprapubic pressure by the operator or an assistant, the head will usually be found in one of the oblique diameters, and partially engaged. While there are several methods of extracting the after-coming head, two are especially prompt and efficient; in the first, the operator introduces the left hand with its palmar surface upward into the vagina, and places his longest and strongest finger within the mouth of the child. The first and third fingers rest upon the shoulders of the infant. The child lies astride his forearm. His other hand is laid broadly across the mother's abdomen just behind the pubes, and while strong traction is made by the hand which grasps the fœtus, vigorous counter-pressure is performed by the external hand. It is rarely the case that the rapid extraction of the fœtal head does not follow.

When this manœuvre fails no time should be lost in applying the forceps. If possible, it should be fitted to the sides of the child's head; axis-traction should be used, the body of the child being held out of the way by an assistant. The head can usually be delivered by a few strong pulls. If difficulty is experienced in fitting the forceps accurately to the sides of the head, Simpson's forceps, preferably, should be inserted at the sides of the pelvis, the head grasped in the best manner possible, and strong axis-traction made. Flexion will follow and delivery ensue.

The rapid extraction of the fœtus, if at full term, is rarely accomplished without laceration to the mother. The cervix may be torn to its junction with the vagina, the pelvic floor lacerated, and the perineum ruptured. Nothing but danger to the mother's life would justify such a procedure, and the necessity for it is, fortunately, not common. If the mother's condition permits, these injuries should be at once repaired; or, if complete suture is impossible, bleeding vessels in the cervix should be closed by suture, and a like precaution taken with tears of the pelvic floor and perineum.

In cases of rapid extraction of the fœtus after version the operator will usually find the placenta partially or wholly separated, and often closely following the child. In these cases the operator should invariably remove the placenta as soon as possible, and assure himself, by the introduction of the entire hand within the uterus, that no clots or pieces of membrane are retained. The womb should be thoroughly douched with lysol, 1 per cent., and tamponed with iodoform gauze. This procedure takes but a few moments, and may prevent septic infection. So soon as the womb is empty, strychnia should be given (1-15th grain) by hypodermic injection, saline transfusion copiously added if needed, and appropriate treatment addressed to the condition of shock which may be present. It is often possible twenty-four hours after such delivery to repair the cervix, pelvic floor, and perineum with chromicized catgut; this should be done, if possible, and good union is often obtained.

While version and rapid extraction are sometimes indicated, the removal of the fœtus should usually be performed very gradually. If, for example, the fœtus be dead and the mother in no immediate danger, it is far better to consult her interests only, and to extract the child deliberately.

Mortality.—The comparative mortality of rapid extraction or delay after version may well be estimated with reference to Dohrn's statistics[186]. In 903 transverse presentations, 23 fœtal deaths resulted from premature loss of *liquor amnii* after intervals of several hours. Version was performed in most of these cases so soon as the internal os would admit the hand. By comparing the fœtal mortality of spontaneous delivery in breech presentation with the mortality following version and extraction, he reaches the belief that extraction should be delayed so long as possible in the interests of the child. In 842 cases of spontaneous birth in breech presentation the fœtal mortality was 49 per cent. In 5,592 cases of version and extraction the fœtal mortality was 57 per cent. In the artificial labor the coaptation of the fœtus to the birth-canal is less perfect, and the child is much more exposed to injurious pressure; hence the increased mortality.

In cases of partial placenta prævia, when the mother is in fair condition and version has stopped the bleeding by compressing the placenta with the infant's body, delivery should not be rapid. The operator, having brought down the head into the pelvic brim and having applied forceps, should make gradual traction with regular intermissions, thus favoring dilatation of the parts and avoiding laceration. If one leg has been secured and fastened by a noose, the operator may wait from fifteen minutes to a half-hour before making essential traction upon the body of the child. The uterus, meantime, should be stimulated to regular contraction, preferably by gentle massage and by the administration of alcohol, quinine, or coffee. Ether or chloroform inhaled in small amounts often serves as a stimulus to the continuation of labor. Especial attention should be paid to maintaining flexion of the arms and head by suprapubic pressure, and if the child be followed down as it descends, the final delivery will be greatly expedited. The obstetrician should assist the child's descent by gentle traction, supplementing this by suprapubic pressure and uterine massage. When the hips of the child appear at the vulva, if the second leg has not descended, it should be unfolded and extracted. The legs should be wrapped in a warm towel, and gentle traction made upon both during the continuance of the labor. The manœuvres for extracting the arms and gradual delivery are the same as those just described, with the exception that the operator employs more deliberate manipulation, and by avoiding strong traction on the trunk also avoids the danger of throwing the arms above the head.

[186] Dohrn: Zeitschrift für Geburtshülfe und Gynäkologie, Bd. 14, Heft 1.

When the head of the child reaches the pelvic floor it must, of course, be promptly extracted; the mother, being in fair condition, will aid materially in this procedure by closing her lips tightly and strongly bearing down. In uncomplicated cases, if the thighs and trunk of the child be bent strongly upward and backward toward the mother's abdomen, and if the operator makes strong suprapubic pressure downward and backward, the mother co-operating by bearing down strongly, the head will readily be born. Should the mother's pain become so severe as to paralyze her efforts, the rapid inhalation of chloroform will usually obviate this trouble. Occasionally, the levator ani muscle contracts so strongly when the head reaches the pelvic floor that the head is retained firmly, and great difficulty is experienced in efforts to deliver. The prompt use of chloroform completely removes this obstacle.

If the mother is in good condition after the delivery of the child, the placenta not having been separated and bleeding being absent, there need be no haste in removing the placenta. The obstetrician may wait fifteen to twenty minutes, encouraging the mother, when she has had a brief rest, to bear down and thus to separate and expel the placenta spontaneously. Should, however, this effort fail, the after-birth must be artificially delivered, and the uterus thoroughly emptied, as already described. Gradual delivery after version is accompanied by little shock. In many cases the patient seems less fatigued than after a tedious spontaneous delivery. Lacerations are often less in frequency and extent, because time is given for the gradual dilatation of the birth-canal; hence no extensive repair is needed in these cases.

While the life of the child is often lost in both rapid and gradual extraction after version, still in many cases the infant can be revived, although born asphyxiated. This is especially the case when the child is not large in size, the birth-canal not firm and resisting, when bleeding has not occurred, and when the cranium and thorax have not been exposed to severe pressure. An effort should invariably be made to resuscitate the infant, and such will often prove successful.

The Complications of Version.—It is evident that various conditions of the mother may seriously complicate the performance of version. We shall speak of contracted pelvis later, in connection with the choice of the operation. There are, however, other conditions which may be present, which may render version impossible or seriously complicate its performance.

The constant danger and oftentimes complications of version lie in rupture of the uterus, or tearing of the vagina from its attachment to the womb. Obstetricians, with Zweifel, Veit, and van der Mey,[187] agree in condemning version when uterine rupture threatens, and in urging embryotomy or Cæsarean section. It is occasionally possible where rupture of the uterus follows version to rescue the patient by cœliohysterectomy, as in a case reported by Arndt[188]. In this patient version was performed one and a half hours after rupture of the membranes, by a skilled operator, and without apparent difficulty. The uterus, however, had been torn from its attachment to the vagina. When, however, the uterus has ruptured before an attempt at delivery has been made, version is indicated only when the rent in the womb is a small one, when but a small part of the fœtus has escaped, when but little bleeding has occurred, and when the womb is not tightly contracted upon the child. In thirty-one cases of uterine rupture version was performed in four.

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[187] Monatsschrift für Geburtshülfe und Gynäkologie, Band 1, Heft 2, 1895.

The worst complications of version are found in patients in whom the operation has been badly chosen, some insurmountable obstacle to delivery having been overlooked. It is almost impossible in such cases to avoid severe injury to the mother: thus Pinzani[189] reports the case of a woman who had severe pelvic deformity, on whom internal version had been unsuccessfully tried, the operator bringing down a foot and hand. Complete rupture of the urethra and part of the posterior wall of the bladder had resulted. Although the patient was delivered by the Cæsarean operation, she died of pyæmia on the seventeenth day. A somewhat similar case is reported by Routh[190]; this patient had been delivered by version by the house physician of a maternity hospital: hemorrhage and collapse followed. On examination the vagina and uterine segment were badly torn, the umbilical cord prolapsing through the rent. The patient died from pyæmia. Löhlein[191] reports the case of a patient who died after her third confinement, her first having been terminated by embryotomy, and the second by symphysiotomy. In the third labor an attempt was made to deliver by version and extraction, which resulted in serious laceration of the cervix, lower uterine segment, and vagina, with death from hemorrhage. Occasionally, rupture of the uterus during version is followed by recovery. Treu[192] describes the case of a multigravida whose child died within the womb, and in whom it was necessary to extract the dead fœtus by version; the lower portion of the uterus was bound down by an old adhesion extending across the posterior surface of the lower uterine segment. The lower segment ruptured just above this adhesion: the fœtus and placenta, however, were removed without especial difficulty, the patient making a good recovery. These cases are sufficient to indicate the dangerous complications of version in improper cases.

Certain abnormalities in the position of the fœtus contraindicate version; thus, in ectopic gestation where the child has developed after the escape of the embryo from the tube. Occasionally, double version is required in twin pregnancy. Loviot[193] reports two cases of twin

[188] Arndt: Centralblatt für Gynäkologie, No. 24, 1896.
[189] Pinzani: Ann. di Ostét, e Ginécol., No. 12, 1894.
[190] Routh: British Medical Journal, No. 1695, 1893.
[191] Löhlein: Deutsche medicinische Wochenschrift, No. 19, 1896.
[192] Treu: St. Petersburger medicinische Wochenschrift, No. 47, 1894.
[193] Loviot: Annales des Gynécol. et d'Obstétrique, June, 1892.

pregnancy in which transverse presentations or anomalous presentations of the fœtus required the performance of double version. Rœsger[194] describes the case of a multipara in whom the uterus was greatly distended; both children presented in transverse presentation in separate fœtal sacs: each was delivered by version.

Unusual Complications.—Complex presentations in the fœtus often embarrass the operator greatly in the performance of version; a shoulder and small fœtal parts may become so impacted in the pelvic brim as to constitute a wedge, resisting all efforts at spontaneous expulsion. In these cases the wedge must be broken up before delivery can occur in any manner. If the child be dead, embryotomy may prove the more advisable procedure; but if the child be living, the patient should be thoroughly anæsthetized with chloroform, the hand introduced gently, and the fœtus sufficiently moved from its position to enable the smaller parts to be pushed out of the pelvic brim and version to be performed. It is only by the exercise of the utmost patience, with considerable strength and dexterity, that this procedure can be successfully employed. The hand, however, is the safest instrument for this purpose, as it appreciates the resistance of the uterus and also any gain which may happen through decomposition of the wedge. Should such an effort not succeed, abdominal section will often prove the safest method of delivery. It is occasionally observed that the contraction-ring, when strongly developed, may resist the movements of the fœtal shoulder; thus, Helme[195] describes a case in which the contraction-ring successfully resisted all movement of the fœtal shoulder. The prolapsed arm was finally pulled down and the fœtus pushed upward into the uterine cavity, when version was readily accomplished.

Brow presentation has been considered by some as an indication for version. When, however, the head of the child is firmly compressed at the pelvic brim, Vallois[196] would avoid version because of the danger of uterine rupture, and would perform symphysiotomy instead. It is considered in these cases that the impaction of the head is so well marked that any effort to dislodge it must result in serious injury. In dorso-posterior positions of the fœtus version sometimes fails; thus Zweifel[197] reports a case in which he failed in version, and ended labor by decapitation. Sänger, in 1892, described a case of dorso-posterior position in which traction was made upon the upper foot, the arm having prolapsed; the result was impaction of the fœtus and rupture of the uterus. In these cases Zweifel urges the operator not to pull upon the upper foot of the child; if the arms have prolapsed, they should be let alone and either foot grasped, and traction made strongly downward and backward toward the sacrum.

Cephalic version may be rendered impossible by coiling of the umbilical cord about the fœtus; thus, Budin reports one case in which the cord was about the trunk and beneath the axillæ; it was cautiously dislodged and labor proceeded spontaneously. Defour reports two cases in which cephalic version was prevented by the cord about the neck. When ordinary manipulation fails, the fœtal body must be carefully palpated to determine the presence of such a complication.

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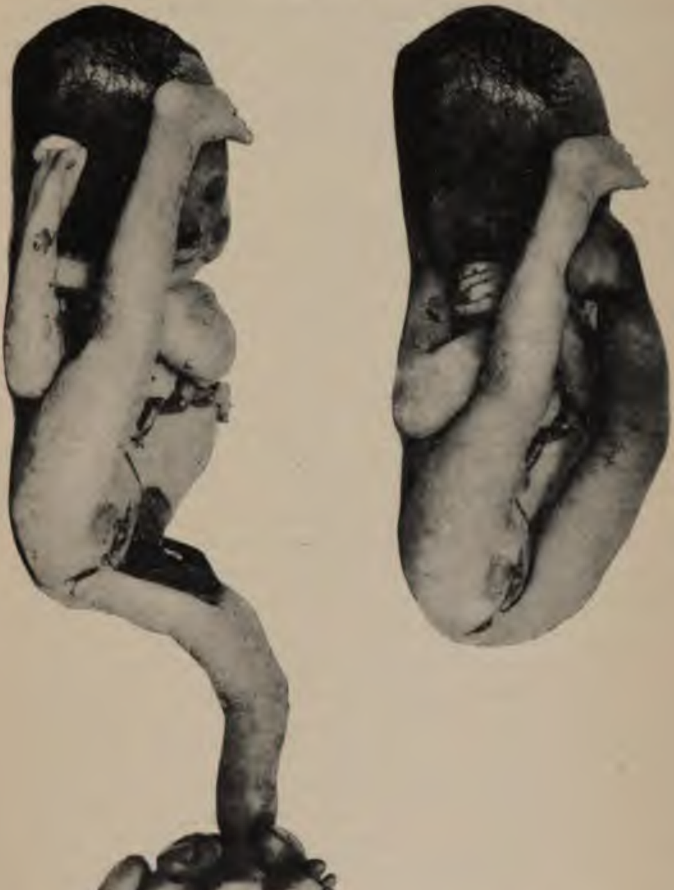
[194] Rœsger: Centralblatt für Gynäkologie, No. 22, 1890.
[195] Helme: British Medical Journal, No. 1589, 1891.
[196] Vallois: Archives de Tocologie, No. 8, 1894.
[197] Zweifel: Centralblatt für Gynäkologie, No. 20, 1895.

FIG. 208.



Compound presentation; extraction by the feet showing congenital clubfoot.
(Keller: Archiv. für Gynækologie, Band 67, Heft 2, 1902.)

Version after Abnormal Fixation of the Uterus.—Methods of fixing the uterus by operative procedure have given rise to interesting complications in subsequent pregnancies. Experience has shown that, in cases of vaginal fixation of the uterus, the fœtus oftentimes assumes abnormal positions by reason of the abnormal condition of the womb which renders version necessary. In Milander's report of these cases[198], a case of delivery by version after ventrofixation is described by Frommel; Gubaroff performed Cæsarean section on a primipara who four years previously had a ventrofixation performed by Küstner: in this patient two unsuccessful attempts were made to perform version. Milander also performed version in a case of cross-birth, the back posterior, occurring after ventrofixation. Podalic version and slow extraction delivered a living child. In seventy-four women who had ventrofixation and who became pregnant, three cross-births required version. It is evident that any form of ventrofixation which fastens the uterus by a broad, firm band of adhesion predisposes to great dilatation of the posterior wall of the uterus during pregnancy, and to malpositions of the fœtus, necessitating version. In operating upon these cases great caution and patience are necessary. Strassmann[199] considers version indicated early in labor in patients who have had vaginal fixation of the uterus. Wertheim[200], in thirty-seven patients operated upon by vaginal fixation, had three who subsequently became pregnant. In one of these cases the posterior wall of the uterus was stretched so excessively that version was performed early. After the foot had been brought down, a weight was attached to it and the further expulsion left to Nature: three hours after, a living child was born. In some of these cases, after version uterine relaxation and hemorrhage have been reported, which greatly complicated the mother's recovery. Dührssen reports a case of vaginal Cæsarean section in a patient who had vaginal fixation of the uterus and could not be spontaneously delivered. His operation consisted in opening the vault of the vagina and uterus, and performing version and extraction: mother and child recovered.

Version and Symphysiotomy.—As symphysiotomy is successful in enlarging the pelvis, it would seem that in a pelvis thus made larger version might meet with decided success. On the other hand, injury to the vaginal walls may readily happen after symphysiotomy, if the soft parts are brought strongly upward against the cut ends of the pubic bones, and hence version, which puts the birth-canal upon the stretch, might readily result in injury after symphysiotomy. There are, however, a considerable number of cases on record in which symphysiotomy has been followed by version and extraction. Thus, Garrigues[201], after symphysiotomy performed version, extracting the head of a full-term male fœtus with considerable difficulty. Mother and child recovered. Symphysiotomy in some cases may follow version when it is apparent that the pelvis is too small to permit successful extraction. Thus, Braun[202] reports a case of transverse presentation in a patient whose children had previously died at birth, in which version was first performed. As delivery proved impossible, symphysiotomy was then resorted to, followed by extraction. One of the sacro-iliac joints was slightly injured during the delivery. Mother and child made a good recovery. Spaeth[203] describes a case in which he succeeded after symphysiotomy in delivering a living child by version when axis-traction forceps failed. From the study of statistics, he finds that symphysiotomy and version have a mortality of 9 5-10 per cent. to mother and child, while symphysiotomy and forceps give a death-rate of 11 per cent. for the mother, and 21 per cent. for the child. In Pinard's report of symphysiotomies[204] we find the conclusion that when the head remains high after symphysiotomy version is better than forceps, but that when the head descends into the pelvis so soon as the pubic joint is open, that the forceps should be chosen in preference to symphysiotomy. In twenty symphysiotomies, version was done in three cases in which forceps failed to extract.

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[198] Milander: Zeitschrift für Geburtshülfe und Gynäkologie, Bd. 33, p. 464.
[199] Strassmann: Archiv für Gynäkologie, Band 1, Heft 3.
[200] Wertheim: Centralblatt für Gynäkologie, No. 2, 1897.
[201] Garrigues: American Journ. Med. Sciences, March, 1893.
[202] Braun: Centralblatt für Gynäkologie, No. 26, 1893.

Version and Forceps.—It is most natural to compare version with the use of forceps, as the two operations are constantly presenting themselves for the practical choice of the obstetrician. Our former grounds of selection in these cases were largely based upon the conception commonly held of the results of forceps-pressure upon the fœtal head. It was formerly taught that, if the forceps was applied over the face and occiput, bulging of the parietal diameter occurred, considerably increasing the measurements of the head in this direction. Aside from the possible injury to the face following application of forceps to face and occiput, it was commonly believed that the procedure was useless, especially in contracted pelves. The investigations of Milne Murray tend to show the fallacy of this belief. He has demonstrated by experiment that the occipito-frontal diameter of the head may be compressed from one to one and a half inches without increasing the biparietal. The various segments of the cranium slide under one another, and thus a vertical, and not a transverse, expansion results. In flattened pelves, where version was formerly thought to be clearly indicated, Murray urges the application of forceps; he asserts that he has delivered living children where the antero-posterior pelvic diameter of the mother's pelvis was three and a quarter inches, and even two and three-quarters inches. In these cases, so soon as the head passes the promontory of the sacrum, the forceps and head naturally rotate into the posterior extremity of one of the oblique diameters, and the head descends in this diameter through the pelvic cavity. Frank[205] would not apply forceps unless the greatest circumference of the fœtal head was already within the pelvis. He urges the advantages of version in these cases; and when version cannot succeed, he would resort to craniotomy.

Schultz[206] reports a series of cases in which he chose the forceps

[203] Spaeth: Monat. f. Geburtshülfe und Gynäkologie, Bd. 2, Heft 2.
[204] Pinard: Annales de Gynécologie, January, 1896.
[205] Frank: Monatsschrift für Geburtshülfe, Band 3, Heft 1.
[206] Schultz: Zeitschrift für Gynäkologie, Band 24, Heft 2.

instead of version. This embraces contracted pelves, primiparous labor, threatened uterine rupture, and prolapse of the cord. He would perform version when an indication for the immediate termination of labor arose. When the amniotic liquid has long since escaped he considers version preferable. He would choose forceps, however, in slightly contracted pelves when the os and cervix are well dilated. In contracted pelves of high degree forceps should be applied as a tentative measure only, and with great caution. He thinks the use of forceps an easier operation than version, and considers the result generally better for the mother and child.

Version in Contracted Pelves.—In flat pelves version has long held the favorite place among methods of delivery. It has been urged that after version the fœtal head is brought transversely through the pelvic brim, thus offering its bitemporal diameter, which is a small one, to the contracted antero-posterior diameter of the brim of the pelvis. In these cases the occiput would fit into the space at the side of the sacrum, and thus the head would pass through a considerably flattened pelvis. This view, however, must be modified somewhat in the light of recent researches, already quoted, upon the action of forceps when applied to the occipito-frontal diameter of the head. There is no question, however, that in many cases of contracted pelvis where the degree of narrowing is a moderate one, and especially where flattening of the pelvis is present, that version presents a most efficient method of delivery. Thus, Hausen[207] reports three cases of version in contracted pelves in women who had previously had difficult births. Two of these were flat, not rhachitic, pelves, but slightly contracted; the third was a flat, rhachitic pelvis. The children were at term, and both mothers and children recovered. Version was performed under chloroform in these cases, and the patient's uterine contractions were excited by allowing her to come partly from the anæsthetic after version was completed. Scharlan and Strassmann[208] write concerning version in contracted pelves. The former would choose this operation in moderately contracted pelves, and in those in which the true conjugate was 7½ cm. Strassmann urges the difficulty which sometimes arises in bringing the after-coming head through a moderately contracted pelvis.

In general, modern teaching upon the subject of version in contracted pelves may be summed up as follows: in simple, flat pelves of moderate contraction version is exceedingly successful. In symmetrically contracted pelves of moderate contraction every effort should be made to induce the head to engage, when Walcher's position and the use of forceps will usually deliver the patient. In all considerable degrees of pelvic deformity Cæsarean section should be chosen, and version avoided.

There are some who assert that an unfavorable position of the fœtal occiput justifies the obstetrician in the performance of version; chief among these is Grandin, whose writings upon the subject in his *Text-Book* are familiar. There is no question that one skilled in version can thus terminate promptly and with good success a labor which otherwise would be tedious and possibly dangerous to mother and child. Those, however, not accustomed to the practise of version would do well to secure, if possible, anterior rotation of the occiput by manual rectification, completing labor by the application of forceps.

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[207] Hausen: Hospital-Tidende, September 9, 1891.

[208] Scharlan and Strassmann: Zeitschrift für Geburtshülfe, Band 29.

Version or Symphysiotomy.—In cases of moderately contracted pelvis the interesting question often arises, shall labor be allowed to proceed until the membranes have ruptured and labor-pains have had an opportunity to bring about engagement of the head or spontaneous birth, or shall delay be obviated by the prompt performance of version before the membranes rupture, and so soon as dilatation is complete? In view of the success of symphysiotomy, the choice in some cases becomes a matter of considerable difficulty. Wehle[209] had an unusual opportunity for comparing the two procedures. Two cases of flat, rhachitic pelves were admitted to the Dresden clinic within a few hours of each other; the first had an internal conjugate of 7 cm., the second of 6 5-10 cm. In the first, version and extraction were practised; in the second, symphysiotomy. Both mothers and both children recovered. The version was made so soon as the os was dilated, and before the membranes had ruptured. The patient was placed in Walcher's position, and a child weighing 3,780 grammes was rapidly extracted. The mother was discharged convalescent in ten days.

In the second case the symphysiotomy proceeded without complications, and the after-treatment was entirely successful; four weeks, however, were consumed in the patient's recovery.

In the same journal Bushbeck reports the general results of nine symphysiotomies performed during two years in the Dresden clinic among a total of 3,210 confinements: it is, however, Leopold's teaching that in pelves having a true conjugate of 7 cm., in flat, rhachitic pelves, with 7½ cm. true conjugate, and in justo-minor pelves, that version so soon as the os is dilated and before the membranes rupture gives best results for mother and child.

Olshausen[210] criticises the stand taken by Leopold, and calls attention to the fact that it is in many cases impossible to assert that spontaneous birth cannot occur unless the operator delays until after the membranes have ruptured before he interferes. If such delay be practised, it is evident that version is not so applicable as symphysiotomy. When the amniotic liquid has largely escaped version is attended with more difficulty and violence to the mother than is symphysiotomy usually; hence, unless the operator is positive, judging from the shape of the pelvis and estimating as well as possible the contour and size of the head that version will be successful, it is the part of wisdom to wait until the membranes rupture and the patient has had several strong pains before submitting her to interference. On the other hand, there are many operators especially proficient in version who can unquestionably do better by performing this operation in all possible cases.

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[209] Wehle: Münchener medicinische Wochenschrift, No. 25, 1894.

[210] Olshausen: Central. für Gynäkologie, No. 36, 1894.

In making a practical choice of these two procedures, it must be remembered that, under antiseptic precautions, the maternal mortality of version is very little; the fœtal mortality, however, is considerable. On the other hand, symphysiotomy is a child-saving operation, which, however, exposes the mother in some cases to considerable risk. When the conditions are all favorable for version there can be no question of the fact that this procedure can be carried out more successfully by one individual without skilled assistance or with but limited help, than any other obstetric operation. If necessary, the operator can anæsthetize his patient himself and perform the version: this is the reverse of what is true in symphysiotomy, where several assistants are required, and where full antiseptic precautions are necessary.

Again, if version be not attempted, if the head can be brought just within the pelvic brim, it may be possible to secure delivery by the use of forceps in combination with Walcher's position. Should forceps fail, however, symphysiotomy can readily be performed. This is especially well illustrated in Pinard's cases in the French clinics, where it is customary to apply forceps, and if descent of the head does not follow, to perform symphysiotomy without removing the forceps. The after-treatment, however, of symphysiotomy is so prolonged and laborious that the operation must be confined to cases where good nursing is available for a considerable length of time. In comparing the two procedures, version still remains the most prompt, simple, and efficient treatment, capable of fulfilment by a single skilled person, among the resources of the obstetrician. Version is especially appreciated by physicians who practise where assistants are difficult to obtain, and who are familiar with the use of chloroform in various obstetric manipulations.

The Frequency of Version and Its Results.—Among the most interesting of the many questions relating to version is the choice of the operation in view of the success of modern Cæsarean section and the induction of labor. Modern writers having extensive clinical observation publish from time to time results of groups of cases, from which the field of version in comparison with other operations may be determined. In Leopold's book[211] upon Cæsarean section are reported 45 cases of induced labor in contracted pelves, with but one death, and that from sepsis; 71 craniotomies are reported, with no maternal mortality from sepsis; 107 versions are also reported, with septic mortality of *nil*. The mortality after Cæsarean section is stated to have been at Dresden 8 6-10 per cent., of which 4 3-10 per cent. was from sepsis. A similar book has been issued by Braun and Herzfeld, of Vienna[212], in which are given the results collected in 2,607 labors; among these patients, 444 had contracted pelves: the frequency of the different operations is shown by statistics appended. Induced labor was performed 54 times in 23,911 cases: all of the mothers recovered without essential rise of temperature: of the children, 35, or 73 per cent., were born living. Version and extraction were performed 89 times in contracted pelves in 20,607 labors. Results of version were two maternal deaths, and, as regards the child, 55 children born living and 34 dead; and deducting cases in which the fœtus was dead before version was performed, we have 75 infants, of whom 55 were born alive and 20 were dead. Curiously enough, among these cases there were 78 atypical forceps deliveries for contracted pelves, and of these, one died of sepsis. In craniotomy, 56 cases were so treated, five of the mothers dying. It is of especial interest to note the results of natural, spontaneous labor in contracted pelves; this occurred 163 times in 20,607 births, and among these but three children were stillborn. The results of various forms of Cæsarean section showed, first, a mortality of 41 2-10 per cent.; this result was afterward improved greatly by the perfection of hysterectomy.

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[211] Leopold: Der Kaiserschnitt und Seine Stellung zur Künstlichen **Frühgeburt** Wendung und Perforation bei Engem Becken. Stuttgart. Enke. 1888.

From the Rotunda we obtain the report of Smyly,[213] the master of the hospital, in which are reported 3,602 labors, and among them version was performed in 25 cases. Ross,[214] of Toronto, in his analysis of 6,777 cases of confinement, reports 45 versions, in 19 of which the child was saved, and in 26 it was lost.

During the Congress at Geneva a report was rendered concerning the frequency of various forms of contracted pelves in different countries, and also the treatment followed by various operators in dealing with these cases.[215] Barnes, of London, in 38,065 cases of labor, found 150 flat pelves, and 45 otherwise deformed; among these patients version was done 74 times. Pestalozza, of Florence, among 7,962 pregnant patients, observed 2,437 in which the pelvis was slightly altered; 38 versions were done among these cases. One of these operations resulted in rupture of the uterus, and death. Guéniot[216] reports his observations in 60 contracted pelves. Cephalic version was performed twice, forceps and version once, and podalic version once. Massen[217], in 2,061 labors, reports 16 versions made before labor was fully advanced and by choice. In three of these the pelvis was contracted, its oblique conjugate measuring 10 4-10 cm., and in nine cases the conjugate varied from 10 5-10 to

[212] Braun and Herzfeld: Der Kaiserschnitt und Seine Stellung zur Künstlichen Frühgeburt, Wendung, Atypischen Zangenoperation, Craniotomie und zu den Spontanen Geburten bei Engen Becken, Wien, 1888.

[213] Smyly: Dublin Journal of Medical Sciences, July, 1893.

[214] Ross: American Journal of Obstetrics, 1895.

[215] Monat. für Geburtshülfe und Gynäkologie, Band 4, Heft 5.

[216] Guéniot: Annales de Gynécologie, August, 1895.

[217] Massen: Annales de Gynécologie, September, 1894.

9 cm., while in three cases it ranged between 9 and 7 cm. Fourteen children were born living, and two asphyxiated. None of the women died, although some had rise of temperature.

In a paper upon the "Treatment of Cancer of the Uterus during Pregnancy," Theilhaber[218] has collected five cases of pregnancy complicated with cancer of the womb, in which version was performed at the end of the pregnancy. In only one did mother and child recover; in three, both mother and child died; in one, the mother lived and the child perished.

Spontaneous Evolution.—In neglected cases we occasionally observe a species of spontaneous version, which is often spoken of as "spontaneous evolution." The fœtus being in transverse presentation and the shoulder impacted, continued pressure from uterine contractions doubles the trunk of the child laterally in a very strong manner, gradually forcing down the breech and thighs until version is performed. In other cases one shoulder is first born, then the other, then the chest and breech, and finally the legs. Ordinarily, one would expect such delivery might be possible where the child is small, the mother's uterine contractions vigorous, and the birth-canal very dilatable. In some cases slight pelvic contraction is present; thus, Grasemann[219] reports the case of a slender primipara with slightly flattened pelvis, in which the fœtus lay transversely, the back posteriorly, the right arm having been forced downward into the vagina. The shoulder was wedged into the pelvis. The chest of the child was deep in the pelvis. The head and the breech had been forced upward. The patient's pains were so strong that uterine rupture was threatened. While preparing to perform embryotomy, the right shoulder was observed to be forced downward and gradually expelled, followed by the birth of the left arm and shoulder, then the chest and breech, and finally the legs. The physician in attendance readily delivered the head. The pelvic floor was uninjured; the child had but recently died, and was at full term and of average size; the patient recovered.

CHAPTER VII.

SYMPHYSIOTOMY.

Definition. By the operation of symphysiotomy is understood the opening of the pubic joint for the purpose of enlarging the pelvis. Experiments upon the pelvis make it evident that if the anterior wall of the pelvis be divided at the pubic joint or through the rami of the pubes, the two halves of the pelvis will separate and that a considerable gain in several diameters of the pelvic brim will follow. If the pubic joint be separated in a cadaver, it is observed that the two halves of the pelvis will rotate outward, the rotation taking place upon the sacro-iliac joints. The practical result of this rotation is to enlarge the pelvis in its antero-posterior and transverse diameters and also in the oblique. The relative enlargement between these several diameters by symphysiotomy is that of one, two, and three, respectively. If the separation of the pubes be carried to a degree of 2½ or more inches, the ligaments of the sacro-iliac joints are put so severely upon the stretch that some fibres are ruptured. Although the varying degrees of enlargement of the pelvis have been carefully computed, for practical purposes it is sufficient for the obstetrician to remember that the antero-posterior diameter of the pelvic brim is enlarged to a slight extent, while the oblique diameters are considerably increased. When the fact is taken into consideration that the oblique diameters of the pelvic brim are most important, because the presenting part passes through the pelvic brim with its long diameter in one of the obliques, the practical advantage of symphysiotomy becomes at once evident.

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[218] Theilhaber: Archiv für Gynäkologie, Band 47, Heft 1.
[219] Grasemann: Centralblatt für Gynäkologie, No. 43, 1895.

Indications and Contraindications.—Recalling the fact that a considerable separation of the pubic bones does violence to the sacro-iliac joints, it can readily be seen that symphysiotomy is indicated in cases where but a moderate degree of pelvic enlargement is necessary to permit delivery. In highly contracted pelves, in pelves deformed by reason of disease of the bones, which renders the bones more heavy and firmly knit together than normal, symphysiotomy is contraindicated. In women older than forty years, in whose skeletons ossification has advanced considerably further than in younger women, symphysiotomy may be found difficult by reason of the deposit of bony material in the pubic joint.

A point of great practical importance is the fact that while symphysiotomy enlarges the brim of the bony pelvis, it does not contribute to the enlargement of the soft parts of the birth-canal. In cases where the head has been prevented from descending into the pelvis by disproportion the usual dilatation of the soft parts is not gained, the result being that the cervix and vagina are in no way prepared for the expulsion of the child. If labor be prolonged, the cervix will be drawn up upon the child's head and partially dilated; but complete dilatation of the cervix is rare in such cases before the operation is performed. Immediately after symphysiotomy it is usual to find the head upon the pelvic floor, as the obstacle in descent being removed the head comes rapidly down. As it emerges from the vulva the anterior wall of the vagina is carried upward against the pubic bones. After symphysiotomy the cut ends of these bones may cause injury more or less severe to the anterior vaginal wall during the expulsion of the head. Severe laceration of the tissues about the urethra occasionally results, while in other cases the parts are contused to such an extent that necrosis readily follows. For this reason it is evident that symphysiotomy is most successful in cases where the vulva and vagina are well developed and where the parts are dilated from previous labor or may be readily dilated. When, however, the limitations for symphysiotomy are understood and cases are selected in accordance with these facts, the operation has a distinct field, and, properly performed, will save the lives of many children at small risk to the mother.

The positive indications for symphysiotomy are disproportion between the fœtus and the pelvis, which is not so great but that a moderate enlargement of the pelvic brim will allow birth to proceed. So far as pelvic measurements are concerned, they give but one factor in the solution of the problem. Symphysiotomy will be most successful in pelves whose antero-posterior diameter measures from 8 to 9½ cm. internally. The other important factor in the problem, namely, the size of the child's head, can only be ascertained approximately by careful observation. If necessary, an examination should be made under an anæsthetic, in which the head can be thoroughly palpated and an endeavor made to cause it to descend into the pelvis by suprapubic pressure. In young patients Walcher's position should be tried before abandoning the attempt to bring the head within the pelvic brim. When, however, the head is evidently too large to descend, as shown by careful examination, it is evident that disproportion in the size of the head exists which renders the choice of an operation necessary.

As symphysiotomy is a life-saving operation for the child, it is not to be selected where the fœtus has already perished, as the operation, like all surgical procedures, gives the best results when performed upon patients who are not exhausted.

Cases are sometimes seen in which the child is dead when the physician first is called to his patient. In such a case craniotomy is clearly indicated if the child is too large to be extracted with the forceps. If the disproportion between the head and the pelvis is considerable, craniotomy may not succeed in lessening the size of the head sufficiently to permit of its extraction. In such a case the operator would be driven to choose between delivery by abdominal section, embryotomy, and delivery of the fœtus piecemeal, or symphysiotomy following craniotomy. By the latter, symphysiotomy after craniotomy, a patient can be delivered with least risk of serious injury and with a fair prospect of recovery.

If suitable instruments are available, the skull could be crushed in such a case and extracted without special difficulty.

The operation should not be chosen in women already infected with sepsis or so weakened by long labor or hemorrhage that their strength is greatly reduced. As the operation requires antiseptic precautions, if these are not available it is not wise to do symphysiotomy, as the after-care of such a patient is a matter of much labor and some difficulty. Unless good nursing can be obtained, the operation should not be selected.

To summarize the positive indications for symphysiotomy, it is successful where but moderate disproportion between the size of the child and the mother is present, where mother and child are in good condition, where the soft parts of the birth-canal are dilatable, and where proper care during and after the operation can be obtained.

Preparations.—The preparation of a patient for symphysiotomy requires that the rectum and bladder be thoroughly emptied. The hair should be shaved from the pubes and the skin above the pubic region should be thoroughly scrubbed with soap and hot water, rinsed with hot water, and scrubbed with bichloride of mercury solution, 1 : 1,000, and rinsed with alcohol. The pubic region should be covered with bichloride gauze until the moment of operation. Ether is the best anæsthetic for symphysiotomy, although chloroform may be used if ether cannot be procured. For the convenience of the operator the patient should be laid upon a table of convenient height; a common kitchen table answers well if no better is at hand. The table should be so placed that the patient can be brought down to its edge for the delivery of the child. The table should be covered with a blanket, and at the foot a rubber sheet, with clean linen over the sheet and blanket. The upper portion of the patient's body should be covered with woolen and the feet and legs be wrapped in blankets or covered with appropriate leggings.

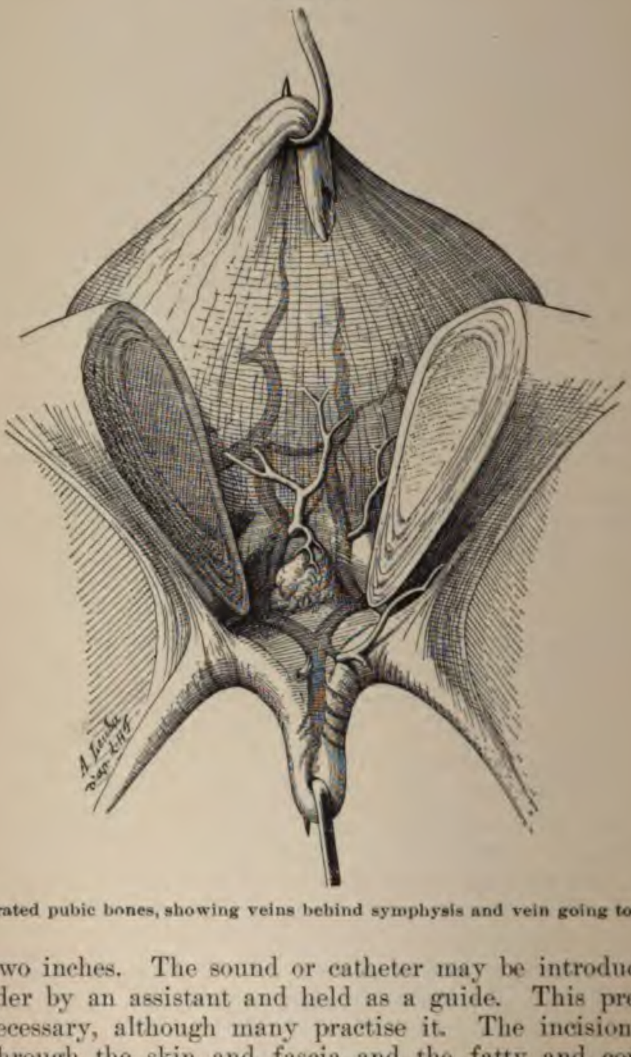
The operator will require a competent person to give the anæsthetic, a competent medical man to assist him, and in addition the services of a nurse or of some one who will absolutely obey his directions.

The instruments required are an ordinary scalpel, a pair of uterine dressing forceps, a half-dozen pairs of hæmostatic forceps, a probe-pointed, strongly-made bistoury, a metacarpal saw, a urethral sound or English catheter, and an axis-traction obstetric forceps. These forceps should preferably be of the Tarnier pattern, designed to fit accurately upon the sides of the head. In addition to the ordinary surgical dressing, antiseptic gauze may be cut in strips four inches wide and a yard long. Iodoform or boric acid in powder must also be ready. For closing the wound silkworm gut is best. A curved needle, needle-holder, and scissors will be required. It is well to have hot and cold water ready for resuscitating the child if necessary.

Methods.—Three methods for performing symphysiotomy have been successful. The first is that originally employed, by which access is gained to the symphysis through an incision through the skin in the median line of the abdomen above the pubes. The peritoneum is not opened, and the fingers are carried behind the pubic bone, breaking up loose connective tissue in that region and pushing back the peritoneum. By the method commonly employed in France the joint is attacked from in front, the bulb of the clitoris and other vessels are pushed aside, a guard is slipped behind the joints and the joint is opened by a knife. By Ayres' subcutaneous method, the joint is opened by a tenotome with a very small incision. We have had very good results with the first method.

The patient being anæsthetized and the hands and arms of the operator and assistant having been thoroughly scrubbed with soap and water, rinsed in hot water, scrubbed in bichloride solution, 1 : 1,000, and rinsed in alcohol, the dressing is removed from the suprapubic region and the field of operation is surrounded with sterile linen; an incision is made in the central line at two fingers' breadth behind the pubic joint, extending upward for one and one-half to two inches. The sound or catheter may be introduced into the bladder by an assistant and held as a guide. This precaution is not necessary, although many practise it. The incision should extend through the skin and fascia and the fatty and connective tissues which lie above the peritoneum and behind the pubic joint. This tissue is to be separated from the joint by the fingers until the fingers can be passed around the joint from beneath. If needed,

FIG. 209.



The separated pubic bones, showing veins behind symphysis and vein going to clitoris.

the incision may be prolonged downward, although it should not be extended further than a quarter of an inch above the posterior border of the joint. When the fingers can be passed beneath the joint the probe-pointed knife may be inserted along the fingers, and carried from below upward and over the joint forward through the cartilage of the joint.

Difficulty is sometimes experienced in finding the joint. The landmark upon its superior surface is a depression or notch which is present in the well-formed pelvis. Some prefer to cut from above downward, placing the knife upon the joint at the notch, allowing the probe-point to project just anteriorly to the surface of the joint, while the finger of the operator below guards the tissues from injury. The knife may be carried through the cartilage in this way until the subpubic ligament is reached, when it may be reversed and passed along the finger and the ligament severed from below upward. The opening of the joint is not complete until the ligament has been severed, for experience has shown that the two halves of the pelvis will not separate readily until the ligament is cut.

While no vessel of considerable size is opened in symphysiotomy, the connective tissue behind the pubic joint oozes sufficiently to require a tampon of antiseptic gauze to be applied during the extraction of the child. The gauze should be passed with uterine dressing forceps behind the pubic joint and between the cut halves of the bones. It serves a double purpose in checking oozing and in carrying the urethra and anterior vaginal wall away from the pubes, so that they will not be injured when the bones are brought together. Antiseptic gauze is then placed over the incision, the sound in the urethra is removed, and the patient is brought to the edge of the bed or table for the delivery of the fœtus. In cases where the joint cannot be opened with a knife by reason of the presence of bony tissue in the cartilage the metacarpal saw may be used to advantage.

Delivery.—While the patient is brought down to the edge of the bed or table and during the delivery of the child, pressure should be made by two assistants upon the trochanters of the femora to prevent undue separation of the two halves of the pelvis. Delivery is usually effected in these cases by the forceps. While it is possible to make version, still a better result is obtained if the axis-traction forceps be carefully applied to the sides of the child's head. In making traction special care should be taken to flex the head strongly and pull downward and backward with the forceps, the object being to prevent injury to the anterior vaginal wall by the occiput while distending the entrance to the vagina. If the vagina is small and the perineum resisting, double episiotomy will assist in avoiding serious laceration. When the head of the child is delivered the delivery of the body is accomplished in the usual manner. The placenta should then be expressed and the patient thoroughly examined to ascertain the presence or absence of tears of the anterior vaginal wall or of the tissues about the urethra. The tissues should be thoroughly douched with lysol 1 per cent. and any laceration of the vaginal wall should be closed by continuous catgut suture. Laceration of the perineum and pelvic floor should be repaired unless the patient is in such a condition of shock as to make such repair impossible. The gauze tampon should then be removed from the symphysiotomy wound, the patient being drawn back again upon the table; the tissues behind the pubes should be thoroughly sponged out with antiseptic gauze and a fresh gauze tampon be carried just behind the ends of the pubic bones to the bottom of the space behind the pubes. The wound should then be closed with interrupted silkworm-gut stitches, the last stitch, where the gauze drain is inserted, being introduced but left without tying. The wound should be freely sprinkled with iodoform or with boric acid and a firm antiseptic dressing applied.

It has been repeatedly observed by various operators that after symphysiotomy the head often descends upon the pelvic floor with the occiput turned toward one or the other of the sacro-iliac joints. In many cases the occiput pointed anteriorly before the operation, but turned behind after the symphysis was opened. No complete explanation is afforded of this rotation of the occiput, unless it be that the manipulation required in performing symphysiotomy, when the operator's hand in the opening behind the symphysis naturally makes pressure upon the head beneath, may result in turning the occiput behind the median line of the pelvis. Another cause would be the tendency of the presenting part, universally seen in labor, to accommodate itself as best it can to the shape of the pelvis. The greatest available space being at the sides of the sacrum, it is natural that the largest portion of the head should turn into this available space.

This rotation has an advantageous element for the delivery of the head after symphysiotomy. With the occiput behind and strong flexion produced by forceps the anterior wall of the vagina will be less tightly stretched than if the occiput were in front, and the danger of laceration against the cut ends of the pubic joint will be considerably lessened. In most of these cases the occiput is upon the right side of the pelvis, at the right sacro-iliac joint.

In using forceps in these cases the operator must be careful to apply them accurately to the sides of the head and to make axis-traction strongly downward and backward. He will thus secure the descent of the head in the best possible manner, and when the pelvic floor is distended by the occiput he should cautiously raise the forceps, producing complete flexion of the head. The anterior portion of the head is smaller than the posterior, and less likely to do injury to the vagina. Injury to the pelvic floor usually happens in these cases; but if episiotomy be done upon one or both sides, the injury will be prevented from becoming a serious one.

Should the fœtus have been in face presentation before the symphysis was opened, this presentation can usually be readily corrected after the opening of the pubic joint, because the enlargement of the pelvis relieves the pressure upon the head and permits the substitution of the small occipito-frontal diameter for the greater occipito-mental or maximum.

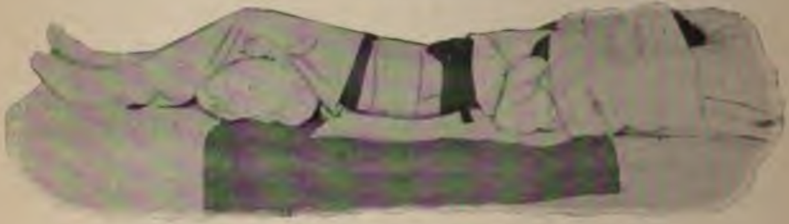
Should the fœtus present by the breech the case is not so favorable for symphysiotomy, and the operation, if possible, must not be chosen. In delivering the after-coming head, the occiput being in front, the greater portion of the head is brought against the anterior vaginal wall, putting the tissues strongly upon the stretch and tending to tear them by forcing them against the cut ends of the pubes. In such a case it is difficult for the operator to make pressure on the occiput behind the pubes, because of the incision and of the severed symphysis. Delivery can often be best effected in such a case by having an assistant raise the body of the child while the operator applies forceps to the head and by making strong flexion reduces as far as possible the pressure of the occiput against the anterior vaginal wall. Some of the lacerations in this region which are most inconvenient to repair are found in the vicinity of the urethra and near the clitoris. A small vessel in this region may be opened and free bleeding may result. Such must be checked by suture and by closing the laceration with catgut or fine silk.

Immobilization of the Symphysis.—One of the most important problems connected with symphysiotomy is the choice of a method to immobilize the pubic joint during the patient's recovery. A strong binder may be fastened tightly about the patient; a canvas belt with straps and buckles may be applied; and a plaster-of-Paris cast may be employed. While various means have been used successfully to accomplish this purpose, the writer has succeeded well by using a single strip of the best rubber adhesive plaster, six to eight inches wide and long enough to pass completely about the patient. The application of the plaster requires the united work of several persons. The patient's pelvis should be raised with great care, strong pressure being continued upon the trochanters of the femora. The plaster strip should then be passed beneath the patient, the muslin upon the face of the plaster not being removed until the strip is in position, ready for application. It should pass around the pelvis in such a manner that the centre of the strip extends over the trochanter on each side. When the muslin is removed the strip should be brought up and around the patient by two persons stationed opposite to each other, each pulling strongly outward. It is of great importance that the plaster be kept perfectly smooth and that it be thus applied to the body of the patient. The plaster passes over the pubes, firmly holding the two ends of the bones in apposition. Should the edges of the plaster come so low as to interfere with the bowel or with the care of the genital tract or of the bladder, it may be trimmed away with scissors. If the plaster is well applied, no binder is needed to keep the pubic joint immobilized. Should the obstetric binder be applied, care must be taken not to apply it tightly, as considerable distention of the intestines sometimes follows the operation and is a source of discomfort to the patient, if she has in addition a tight binder.

In applying adhesive plaster dressing after symphysiotomy care must be taken lest the uterus be pressed upward out of the pelvis by the plaster strip, and thus uterine relaxation and hemorrhage be induced. This can best be avoided by trimming away the plaster at its upper edge in a curved direction, in such a manner that the convexity of the curve is toward the pubes and its concavity toward the womb. As long as the strip exercises its pressure firmly and evenly over the trochanters it is unnecessary that its pressure on the parts above should be so firm. A light flannel binder or many-tailed abdominal bandage may be applied over the abdomen, making gentle pressure from above downward, and thus keeping the uterus in its proper position in the pelvic brim. Pressure upon the abdomen should be as gentle as possible to avoid compressing the intestine, and thereby favoring the occurrence of intestinal complications, which might lead to inflammatory conditions or even to partial occlusion of the bowel.

Ayres and others have employed to advantage a hammock in the treatment of patients after symphysiotomy. The pressure of the hammock upon the sides of the pelvis brings the severed halves of the symphysis into apposition. The posture is comfortable for the patient and the appliance has proven efficient.

FIG. 210.



Symphysiotomy patient with dressings.

After-Treatment.—An occlusion antiseptic dressing should be placed over the vulva and the patient's knees be bandaged together with a flannel bandage. It is of importance that the bladder be emptied completely in these cases, although patients usually go for a considerable time without passing urine. The urethra is often swollen after symphysiotomy, and the first catheterization of the patient is often difficult and painful. Some operators prefer to leave a soft catheter in the bladder, attaching it to a rubber tube which terminates in a vessel at the side of the bed. Usually the patient must be catheterized for several days after the operation, after which she will empty the bladder spontaneously. If the catheter must be passed, the limbs must be freed from the bandage and slightly separated and the parts thoroughly cleansed with bichloride solution, 1 : 2,000. It is usually necessary to perform this manipulation under the guidance of sight, and in the night it is convenient to employ a candle for this purpose. Experienced and skillful nurses seldom have difficulty in performing this manipulation, but a careless and ignorant person will not usually succeed.

The after-care of the patient delivered by symphysiotomy is essentially the same as that given to every puerperal patient. These cases, however, must lie upon the back for between two and three weeks, which is often irksome and very trying. The bowels should be moved freely the day following the operation.

While the vaginal douche is unnecessary, the orifice of the urethra and the external parts should be thoroughly cleansed with bichloride solution, 1 : 2,000, after each micturition, or whenever the napkins are changed. At the end of the first twenty-four hours the edge of the adhesive plaster may be raised sufficiently to open the dressing partially, remove the gauze drain, and tie the stitch which was left untied at the operation. Should the adhesive plaster become loosened or stretched a second strip may be applied over the first, or the first may be removed and another substituted. It is of the greatest importance that the patient's pelvis be held firmly and steadily by one or more experienced persons. When the strips are changed the patient's skin should be washed with soap and water and then with alcohol.

FIG. 211.

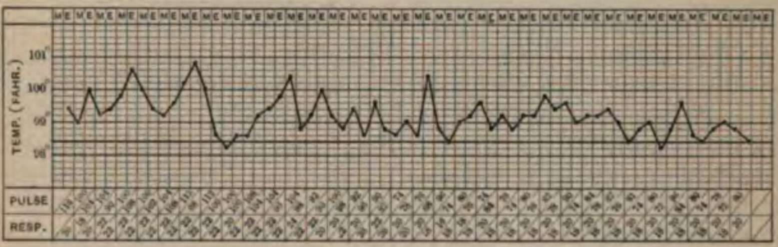


Chart.—Primipara, highly rhachitic pelvis; induced labor. The head failing to engage, symphysiotomy followed by extraction with the forceps. Manual removal of the placenta followed by intrauterine tampon of iodoform gauze. Mother and child recovered.

Once daily the patient may be lifted from her bed by three persons, one taking the shoulders, another the pelvis, and the third the legs and feet, and laid upon a firm, hard mattress or a table or board covered with blankets. The patient's bed may then be made, when she will be much more comfortable for the change. Her diet should be that usually given to puerperal patients. The operation does not necessarily interfere in the least with lactation.

The patient must be kept on her back, preferably for three weeks. At the expiration of that time the plaster should be removed and a canvas binder with straps and buckles should be substituted for it.

The strip of adhesive plaster, however, furnishes the most comfortable dressing which a patient can wear, because of its thinness, the absence of buckles or straps, and the perfect approximation which it gives to the body of the patient. An inferior quality of adhesive plaster cannot be used after symphysiotomy, because it stretches and does not adhere properly or tears, or because it becomes affected by the fluid about the region of the bowel and because the coating of the plaster may become separated. The best quality, if properly applied, will remain for from five to seven days without stretching sufficiently to make a new strip necessary. Should the strip of adhesive plaster stretch slightly, a second and narrower one may be applied over the first.

Another advantage of the plaster dressing over a cloth binder or canvas belt is found in the fact that the canvas belt tends constantly to work up upon the patient's body, and this lessens its efficiency. Again, the belt at its posterior edge is uncomfortable for the patient to lie upon, especially if bones or ribs have been inserted in the belt, as in a corset, to maintain its shape. The ordinary binder is not sufficiently strong to make adequate pressure, and may slip up upon the body of the patient, as does the belt. The many-tailed bandage of flannel is most comfortable, but is not sufficiently firm to hold the pelvis. Plaster-of-Paris would seem on many accounts an ideal dressing, were it not for the fact that the patient must lie upon the dressing, which would be obviously impossible if plaster-of-Paris were used. If great care be exercised in cleansing the skin, in bathing the part beneath the strip with alcohol and ether, and in powdering any abrasion, however slight, with boric acid or oxide of zinc, the skin will not become injured beneath the plaster strip, and the patient will suffer very little inconvenience from the dressing.

The patient may then turn upon her side in bed as freely as she wishes. At the end of the fourth week she should sit up in bed, and then she may leave her bed. She will complain at first of stiffness in the limbs and especially in the hips, but these sensations will gradually pass away.

Results of Symphysiotomy.--The after-results of symphysiotomy can only be ascertained by watching patients engaged at actual work for some time after the operation. If the pelvis of such a person be measured, it will be found slightly larger in each diameter. Good union is commonly obtained at the pubic joint. This union is not always bony in character, but is fibrous or cartilaginous. In some cases close examination will reveal mobility in the two halves of the pubic joint. Patients frequently complain of inability to retain urine. In many cases no anatomical lesion can be found to account for this. These cases are usually relieved by sitz-baths. In other patients careful examination will reveal cystocele or a thickened condition of the tissue about the urethra. In these cases anterior colporrhaphy will often be found advantageous. While cases of necrosis have been reported following the operation, they are rare and must not be considered as the immediate result of the operation. As a rule, it may be safely asserted that where symphysiotomy is properly performed under antiseptic precautions, the pubic joint unites firmly and well and the patient is able to walk and to perform such work as she did before the operation. The only disadvantage which has been observed after the operation has been irritability of the bladder and occasionally a pathological condition of the tissues about the urethra, demanding operative treatment.

As the sacro-iliac joints are sometimes severely stretched during delivery in these cases, it is of interest to observe whether permanent injury to these joints follows the operation. Such, however, is not observed as a rule, nor can it be found upon examination that the sacro-iliac joints in these patients are more movable than are those of other patients who have borne children.

The child does not suffer by extraction after symphysiotomy so greatly as in cases where delivery is effected without the operation, as the pelvis is made so large that usually less bruising and compression of the head occur than when delivery is effected, where disproportion exists, without the operation.

Should symphysiotomy be followed by such difficult delivery of the child as to cause its death in birth, it would be proof that the operation was badly chosen and that Cæsarean section should have been performed.

Symphysiotomy has been performed twice upon the same patient. The second operation was not more difficult than the first, and was followed by equally good results.

Mortality.—The mortality rate of symphysiotomy is variously estimated at from 12 to 18 per cent. for the mothers. This varies, however, greatly in accordance with the skill of the operator, and especially in proportion as good judgment is used in choosing the operation. In fact, the mortality from this operation in America has been due almost entirely to attendant circumstances, and not to the operation itself.

It cannot be undertaken in private houses so successfully or conveniently as in maternity hospitals, as the after-care is much more laborious and trying than the care of a patient following an abdominal section. The mortality rate for children after symphysiotomy is *nil*, as far as the operation itself is concerned. The procedure is a life-saving operation for the child.

Present Place of Symphysiotomy Among Obstetric Operations.—The success of cœliohysterotomy and cœliohysterectomy, under antiseptic precautions, has turned the attention of the profession from symphysiotomy. Those who have had experience with both operations must recognize the fact that, while Cæsarean section may be more interesting for the operator, symphysiotomy in appropriate cases and under antiseptic precautions gives excellent results. The writer tested the operation by eight cases and is not disposed to abandon it under the proper indications. Where disproportion between the child and mother is not considerable, when the birth-canal has been dilated as in multiparous patients or is easily distensible, when mother and child are in good condition and when the operation can be done by competent persons and under antiseptic precautions, we believe that symphysiotomy has a recognized place among successful obstetric operations.

CHAPTER VIII.

CŒLIOHYSTEROTOMY.

By cœliohysterotomy is understood incision of the abdominal wall and of the uterus, followed by extraction of the child and suture of the uterus and of the abdominal wall. The term Cæsarean section is commonly applied to this operation.

Indications.—This procedure is indicated in cases where the disproportion between the child and the pelvis is so great that the child cannot be delivered through the vagina. The disproportion must be so great that delivery will not be possible after symphysiotomy. If pelvic measurement be taken as a guide, the operation is indicated in cases in which the antero-posterior diameter of the pelvic brim internally is less than 8 cm. or $3\frac{1}{8}$ inches. Cœliohysterotomy is also indicated in central placenta prævia, in primiparous patients where the cervix is tightly closed and not readily dilatable. It is also indicated in cases of eclampsia in primiparous patients where the cervix is tightly shut and cannot be safely dilated. Cœliohysterotomy is never indicated in cases where the fœtus is not in excellent condition. Where, from long-continued labor or repeated attempts at delivery, the child has been injured, cœliohysterotomy is contraindicated. If the mother suffers from a disease which renders the life of the child doubtful, cœliohysterotomy is not indicated. In order to be successful mother and child must be in good condition. Thorough antisepsis must be observed and the uterus must be sewed together tightly after its contents have been removed. It is not of importance what presentation the fœtus occupies, nor does the situation of the placenta make a decided difference in the prognosis of the operation.

The best results are obtained in cœliohysterotomy in patients who have been but a short time in labor and on whom no other form of delivery has been attempted.

Time and Preparations.—Some have found that it is unnecessary to wait for labor before operating, but that good results are obtained before labor actually begins. We prefer, however, to operate during the first stage of labor, when dilatation is partially completed. The patient should be prepared for operation by thoroughly emptying the intestines and bladder, by a full and thorough bath, followed by scrubbing of the abdomen with soap and hot water, rinsing with hot water, and scrubbing again with bichloride solution, 1 : 1,000, and finally with alcohol. An antiseptic dressing should be applied over the lower half of the abdomen. In cases of labor complicated by contracted pelvis, the bladder frequently becomes greatly distended by compression of the urethra with the presenting part. Especial care should be taken to completely empty the bladder before the operation. The patient should be placed upon a convenient table in a good light. It is of advantage to use a table which has an attachment capable of giving the Trendelenburg posture if needed, although in this operation it is very rarely demanded. The operator will require a competent person to give ether, and an experienced assistant to control hemorrhage. Several good nurses are desired, while the interests of the child will be best guarded by a competent physician.

The instruments required are a large scalpel, a dozen pairs of hæmostatic forceps, a half-dozen curved needles of several sizes, scissors, dissecting forceps, and needle-holder; while hemorrhage may be controlled by an elastic tube drawn tightly about the cervix, it is much better to depend upon the skillful grasp of a competent person. Aseptic material for sponging, boiled water, iodoform or boric acid, and surgical dressing are required. For suture, silkworm gut, the best silk of medium and fine size, and catgut of medium size may be used. Appliances should also be at hand for resuscitating the child, with stimulants usually employed in surgical practice. Two hypodermic syringes should be in readiness, one containing 1-15 grain of strychnine and 1-150 grain of atropin in solution, and the other should be filled with aseptic ergot. Instruments required for hysterectomy should be sterilized and in readiness. Appliances for intravenous transfusion should also be prepared and a supply of oxygen should be available.

Method.—The patient being etherized, the upper portion of the body and the lower extremities should be wrapped in woolen material and the field of operation surrounded by sterile linen. The abdomen should be opened by a free incision of sufficient size to enable the operator to deliver the uterus containing the child through the incision. As this is done, a large sterile towel should be wrung out of hot water and placed over the intestines behind the uterus. It is well to bring together temporarily the abdominal wall behind the uterus before delivering the child. In some cases in which uterine contractions are strong, if the abdominal wall be brought together tightly behind the uterus, it is sufficient to control uterine hemorrhage.

The first assistant should then grasp the uterus firmly in his hands and circle the cervix in such a manner that the ulnar border of the hands can make pressure upon the vessels of the broad ligaments. Others prefer to grasp each particular ligament between the thumb and fingers, controlling the arteries in this manner.

When the first assistant is ready the operator opens the womb by an incision extending from its middle to an inch below the fundus. If a single cut be made, it is possible to complete the incision with the fingers, thus avoiding the possible danger of wounding the child. The membranes should be instantly ruptured and the child extracted by grasping the shoulder or feet, as may be most convenient. If the placenta is found beneath the line of incision, no time must be wasted, but the operator must instantly tear through the placenta and deliver the child. The hemorrhage cannot cease until the placenta has been removed. Care should be taken not to extend the incision too low upon the anterior uterine wall. If the lower uterine segment is incised, hemorrhage will be greater and contraction of the uterus less prompt and vigorous.

As soon as the child emerges, it should be held head downward, the cord quickly clamped by hæmostatic forceps, and the child, with the cord and placenta attached, given in charge of an assistant. As a rule, it will be found that the uterus contracts well as soon as the child is removed. It may be stimulated to contraction by pouring into its cavity several quarts of hot sterile salt solution, allowing the fluid to run through the cervix and vagina. This empties the uterus of clots and is an efficient means of securing prompt contraction. The abdominal cavity should be thoroughly sponged out and the uterus closed by two rows of sutures. The first should be interrupted silk sutures, each passing through the muscle down to the decidua. They should be a third of an inch apart, and should be so placed that the knot will be covered by the edges of the uterine peritoneum when these edges are brought together. These sutures should be carefully tied without great tension and cut short. The peritoneal covering of the uterus should then be brought together by continuous suture of silk or catgut, beginning from above and proceeding downward. When this suture is finished the uterus should be allowed to descend into the brim of the pelvis as after normal labor. The abdominal wall is then to be closed by a continuous suture of fine silk or catgut, bringing together the peritoneal surfaces. The skin, muscles, and tendons should be closed by interrupted stitches of silkworm gut. Ergot or ergotine should be given by hypodermatic injection and strychnine and atropia also. The abdominal incision should be powdered freely with iodoform and boric acid and covered by a thick antiseptic dressing. As the dressing will not be removed for two weeks after the operation, it is well to bandage the abdomen with adhesive strips, using over these a many-tailed flannel bandage.

Dressing.—It is important that a firm and smoothly applied dressing should be used after cœliohysterotomy. This incision is a long one, the tissues are overstretched and the incision may be separated by violent coughing or straining, hence the abdomen should be firmly supported. We have found excellent results by the application of wide strips of adhesive plaster extending two-thirds around the body and overlapping. If there is a tendency to relaxation of the uterus, a pad of gauze sufficiently large to make pressure should be placed just above the womb and over this the usual abdominal dressing.

Adhesive strips should be smoothly and firmly applied and completely covering the entire dressing. Their application should proceed from above downward and over them may be applied the usual many-tailed flannel bandage.

After-Treatment.—It is well to move the bowels as soon as the patient recovers from the anæsthetic and from the operation. This may be done by repeated doses of calomel and soda followed by a copious enema of glycerin, 1 ounce; magnesium sulphate, 2 ounces; spirit of turpentine, ½ ounce, with water to make 1 quart. In cases where ample time has been allowed to prepare the patient the movement of the bowels may not be attempted until the second or third day after the operation. In cases which have not been under treatment before operation it is better to move the bowels on the following day. The patient should wear an occlusion dress over the vulva, which should be changed as often as needed, and the parts thoroughly cleansed with bichloride of mercury solution, 1 : 2,000. The catheter may be used, if necessary; but should be discontinued as soon as possible.

FIG. 212.

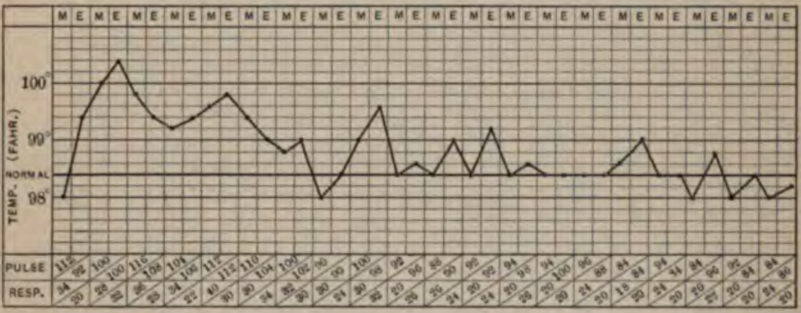


Chart.—Primipara, contracted pelvis, delivery by cœliohysterotomy; uterus packed with iodoform gauze to prevent hemorrhage. Mother and child made uninterrupted recovery.

The patient may be fed in the usual manner after abdominal section, and as soon as the bowels have moved her diet may be gradually increased. The child should be put to the breast as soon as the mother has thoroughly recovered from the anæsthesia and from the operation. Lactation is usually as well performed as if the patient had not been operated upon, and the after-course of the puerperal period is usually normal.

It is interesting to observe that, owing to the absence of tears of the cervix and vagina, the lochial discharge is scanty and contains blood and serum.

Care of the Child.—The child is very often asphyxiated to a slight degree when delivered by Cæsarean section. It seems reasonable to think that this condition may be caused by the interference with the circulation which results from the compression of the uterus during the operation. It is readily resuscitated and usually quite as strong and often stronger than a child subject to the pressure and possible injury of delivery through the vagina. The contour of the skull shows a lack of moulding from the absence of pressure against the bony pelvis.

Mortality and Complications.—The mortality rate for mothers and children from this operation illustrates, in a very marked degree, the life-saving influence of skill and proper assistants in surgical procedures. A single skillful operator with competent help may deliver twenty or thirty cases without a maternal death. On the other hand, an exhausted patient may be operated upon without thorough antiseptic precautions and allowed to lose blood during the operation with fatal result. The complication most to be feared is that of hemorrhage, which, during the operation, can be controlled by skillful pressure. When proper assistance is not available, an elastic rubber tube may be fastened tightly about the cervix until the sutures have been inserted. Should hemorrhage become uncontrollable, the operator must ligate the broad ligaments, tying the uterine arteries, amputate the uterus, and close the peritoneal surfaces tightly over the stump. Hemorrhage after cœliohysterotomy is rare in patients not exhausted before the operation. A tendency to relaxation of the uterus with bleeding may be controlled by gently rubbing the uterus with a sterile towel wrung out of hot sterile salt solution, by repeating the hypodermatic injection of aseptic ergot and by tamponing the uterine cavity with iodoform gauze and bringing the end of the gauze through the cervix into the vagina. With a patient in good condition and with a competent assistant to hold the uterus, serious hemorrhage is rarely seen. When the uterus is packed with gauze it should be removed through the vagina in forty-eight hours after the operation. Following its removal, the vagina and cervix should be thoroughly cleansed by sterile cotton sponges dipped in bichloride solution, 1 : 2,000.

The Question of Sterilization.—It is evident that the operation of cœliohysterotomy leaves the patient capable of subsequent child-bearing. Numerous cases are on record in which women have borne several children, each delivered by this operation. It is the operator's duty, however, to decide, after full consultation with the patient or her friends, whether the circumstances of the patient are such that she should be exposed again to subsequent operation or whether it is best and desirable that she produce no further offspring. If the patient be a woman without home and friends, illegitimately pregnant, and in circumstances in which she is not likely to be subsequently married or lead a moral life, this operation may, with the patient's consent, be rejected for cœliohysterectomy, which renders further pregnancy impossible. On the contrary, if the patient be a married woman in circumstances of comparative comfort and the victim of no constitutional disease which may affect her offspring, the possibility of further pregnancy should not be destroyed unless the patient distinctly requests that this be done.

Physicians of large experience in hospital practise will recognize the fact that there is a considerable class in the community whose reproductive powers should not be indefinitely preserved.

The results of cœliohysterotomy and of cœliohysterectomy as performed in the best hospitals give so good a chance and so nearly an equal chance for recovery that the question of prognosis need not enter into the decision.

Removal of the Stitches.—The stitches over the abdominal incision in these cases should be allowed to remain as long as possible. The abdominal wound is necessarily long, and should the patient be seized with severe coughing or straining the incision might reopen were the stitches removed too soon. As long as they do not cut they need not be removed. As a rule, however, in two weeks after the operation the dressing should be renewed, the stitches removed from the abdominal wound, the parts powdered with iodoform and boric acid, and a light antiseptic dressing applied to the abdomen.

Convalescence.—The patient may usually leave her bed to stand upon her feet at the end of the third or fourth week. She should wear an abdominal support for several months after leaving the hospital.

The convalescence will be greatly hastened by those conditions which increase general bodily vigor, and her recovery will be much delayed by circumstances which depress her general vitality. She should have an abundance of easily-digested diet; the functions of digestion must receive proper attention, and, if anemia is present, iron, arsenic and bitter tonics will be required.

COMPLICATIONS OF CONVALESCENCE.—If the continuous silk or catgut suture has been employed and buried beneath the tissues, it occasionally happens that the knots in the suture may not be absorbed, but may finally work their way out. This is accomplished by the formation of a small, fistulous tract leading down to the knot. The operator need not be annoyed by this occurrence, and he should not take steps too early to secure the removal of the knot. As soon as the thread of the suture has been absorbed the knot will gradually work its way toward the surface of the body, where it can easily be extracted. Such a fistulous tract will heal without great delay, leaving a sound scar. The operator should avoid pulling upon such a knot because of the danger of disturbing the whole length of the continuous suture and possibly causing a separation of some portion of the wound. Examination has shown that silk sutures are absorbed by leucocytes which penetrate between the fibres of the suture, disintegrating the silk and causing its absorption. Unless a knot is unusually large and composed of unusually firm silk, the operator need not despair that this process will ultimately occur. In catgut absorption is much more easy, unless the suture has been chromicized, when it may be retained indefinitely.

Ventral hernia is one of the untoward results of abdominal delivery which the operator is naturally anxious to avoid. Patients are especially liable to this complication after Cæsarean section because of the great length of the incision and the fact that it is made through the abdominal walls which have been already greatly stretched and thinned during pregnancy. This can best be avoided by accurate apposition of the tissues, by a firm, smoothly applied, but not a tight dressing, and by keeping the patient in bed until the abdominal wall has had time to undergo involution. Should the patient be troubled by obstinate cough with violent paroxysms, the cough must be allayed, lest in straining the patient may rupture a portion of the incision. Similar caution must be observed in cases of distention of the intestines after the operation, and violent straining in bowel-movements must be prevented. To allay cough, codeia may be given freely, and suitable remedies addressed to the bronchial tubes should be employed. Distention of the bowel must be prevented by promptly emptying the intestine by the use of the high rectal tube, by douches, feeding, and by suitable injections.

Sudden exertion or straining may bring about a partial or total rupture of the incision, exposing the patient to the dangers of injury to the intestine with the resulting peritonitis.

The treatment of ventral hernia after abdominal delivery consists in waiting until the patient has entirely recovered from labor, and then, under antiseptic precautions, dissecting out the sac of the hernia and uniting the borders of the hernial ring with suitable stitches.

The prognosis is excellent in these cases, and patients are rarely found who are permanently injured by the operation.

INFECTION COMPLICATING RECOVERY FROM CŒLIOHYSTEROTOMY.—Where cœliohysterotomy is done in an emergency, there is not sufficient time to prepare the patient, and infection may occur. Such is usually a staphylococcus or mixed infection from the skin or a bacillus coli communis and mixed infection from the intestine, or a streptococcus infection from the genital canal.

In the first instance, infective material usually travels along the course of the sutures. As adhesion between the uterus and the anterior wall occurs in a large percentage of cases, should the interior of the uterus be infected, germs may pass along the uterine sutures, finally communicating with the sutures closing the abdominal incision. An abdominal uterine fistula will result and some of the knots may be discharged through this opening.

The patient's recovery after such an accident will depend upon the completeness and firmness of the adhesion between the uterus and the abdominal wall. If the tissue be completely adherent, infection will travel through both lines of sutures and drainage will occur without the formation of a fistula. The abdominal cavity will remain shut off and the patient's life will not be jeopardized. If such adhesion is not present, infection from the interior of the uterus will make its way to the peritoneal cavity, setting up a general peritonitis. If streptococcus infection be present, the patient's chance is not so good, as streptococci may readily pass to the peritoneal cavity.

Infection from the intestines cannot be foreseen nor controlled in these cases. It has been the writer's experience to lose one case of cœliohysterotomy in which the peritoneal sac was infected by the bacillus coli communis from the intestine, in which the uterine cavity was found sterile and the wound in the uterus sterile and healed. Occasionally infection may localize itself in the broad ligament and abscess form, which may be drained through the vagina.

TREATMENT.—Should infection occur after cœliohysterotomy, the abdominal dressing should at once be removed and the wound carefully inspected. If there is any sign of infection about a stitch it should be removed and its track thoroughly washed out with peroxide of hydrogen. No attempt should be made to douche or curette the uterus, but the patient's strength should be maintained and a vaginal examination made to determine the presence of abscess in the pelvis. This should be opened as soon as the diagnosis is made. When uterine and abdominal fistula forms, its track should be cleansed daily with peroxide of hydrogen and antiseptic dressings should be used. With these precautions, patients may make a complete and satisfactory recovery, although prolonged, even if infection should occur after cœliohysterotomy.

Subsequent Pregnancy.—As cœliohysterotomy leaves the patient capable of repeated conception, it is naturally of interest to know what effect upon subsequent pregnancies the previous operation will have. The uterus is in most cases adherent more or less firmly to the peritoneal lining of the abdomen. As the womb increases in size its continued growth naturally makes tension upon these peritoneal attachments. Considerable pain and inconvenience are sometimes experienced from about the third to the sixth month of gestation. After that, however, the tissues stretch sufficiently. At the time of induced labor the descent of the uterus may be somewhat hindered by these adhesions and increased danger of failure in uterine contraction and resulting hemorrhage may be present. These disabilities are rarely serious, however, and rarely expose the patient to any considerable danger. Precaution should be taken in these cases to stimulate uterine contractions, to deliver the patient promptly, and to see that the womb when emptied contracts efficiently.

Repeated Operation.—Should a second operation of this sort be necessary, the uterus is usually found perfectly healed. It is sometimes difficult to detect the site of the former incision in the womb. No precautions are necessary to avoid opening the uterus in the old scar, and union is obtained readily after a second or even third delivery by this means. The knots of the sutures buried in the womb can sometimes be detected encysted in the tissues. If silver wire or silkworm gut has been employed in buried sutures in the uterus, they should be extracted before the uterus is again united.

When the uterus and abdominal wall adhere firmly, repeated cœliohysterotomy may be done without opening the peritoneal cavity. It thus becomes a simple and comparatively safe operation. Some urge that at each operation precautions be taken to secure this adhesion by stitching the abdominal peritoneum to the peritoneal covering of the uterus with fine catgut. In repeated operations it is best to open through the old scar, if possible, or, if not, as close to it as the condition of the tissues will permit.

Cœliohysterotomy by Incision of the Fundus.—While much of the credit for making modern cœliohysterotomy successful must be given to Sänger, it has remained for Fritsch to propose and practise a different method. This consists in opening the uterus by transverse incision at the fundus. Advantages claimed for this method are that hemorrhage is less likely to occur, as large vessels are not abundant in this portion of the uterus, that adhesion between other viscera and the uterus is not so common, that incision through the fundus brings the operator to the child in the manner most convenient to extract the child easily and that suture through the fundus may be done more successfully than upon the anterior wall because the tissue is more firm and does not undergo relaxation and contraction. It cannot be denied that the operation may be successfully and conveniently done by incision of the fundus. Adhesions have occurred, however, between the line of incision and other viscera, while adhesion between the abdominal wall and the uterus cannot occur. As such adhesion is a great safeguard to the patient in her convalescence and makes the repeated operation simpler and more safe, it is a very desirable thing, and hence a method which is not followed by such adhesion cannot be considered as desirable as one which brings it about. At the present time, the majority of operators prefer incision of the anterior uterine wall just below the fundus in the median line. In performing the operation by incising the fundus, the same method of suture and the same after-treatment are employed which are used by the other method.

The Results of Cœliohysterotomy as Compared with other Conservative Operations.—Recent statistics show material change in the indications for cœliohysterotomy. The general practise of antisepsis and greater experience with the operation have extended its application very materially. It is now believed that the relative indications for cœliohysterotomy should be advanced to 8½ cm. in flat pelves and 9 cm. in generally contracted pelves for the internal antero-posterior diameter. When, after efficient labor pains for one hour during the second stage the head does not show signs of moulding or descending, Cæsarean section is indicated with the measurements given. Williams' collection of 162 operations with five deaths gives a maternal mortality of 3 per cent. The writer's personal experience in Cæsarean section in all classes of cases numbers 31 at the date of writing. In no instance has mother or child been lost in cases in which the mother was in good condition and uninfected before labor.

Zinke has collected the reports of 88 cases of delivery by incision of the abdomen and uterine wall, done by 54 operators, since January,

1900. The results of these operations were a maternal mortality of 12.34 per cent., and a fœtal mortality of 25.26 per cent. The large number of operators who treated these cases shows that many of them were inexperienced in the performance of the operation. These statistics indicate the results of the operation when done by the general practitioner and upon cases many of which must be considered as unfavorable.

Recent statistics in the use of forceps are given by Dobbin based upon the following conditions: In cases in which the diagonal conjugate measured 10 cm. the patient was prepared for Cæsarean section. She was anæsthetized, placed upon the operating table and axis-traction forceps carefully applied over the sides of the head. If the head did not readily descend and engage with moderate traction, Cæsarean section was done. Under these restrictions maternal mortality was eliminated from forceps operations, while the fœtal mortality in deformed pelves was 9.52 per cent. After version in contracted pelves, the fœtal mortality was 26 per cent.

The mortality of version in contracted pelves is also given by Wolff as .5 of 1 per cent for mothers and 24.5 per cent. for children. This was in carefully selected cases where version was permitted in the lesser grades of pelvic deformity only.

In 100 symphysiotomies Pinard had a maternal mortality of 12 per cent. and a fœtal mortality of 13 per cent. The fœtal mortality of induced labor is too high to permit comparison in the interests of the fœtus with other operations.

In considering these results we must remember that they are taken from a series of carefully selected cases and that they probably represent the best results available at present.

They show great improvement in the saving of fœtal and maternal life, and should cause the obstetrician to consider carefully before sacrificing the life of an uninjured and well-developed child.

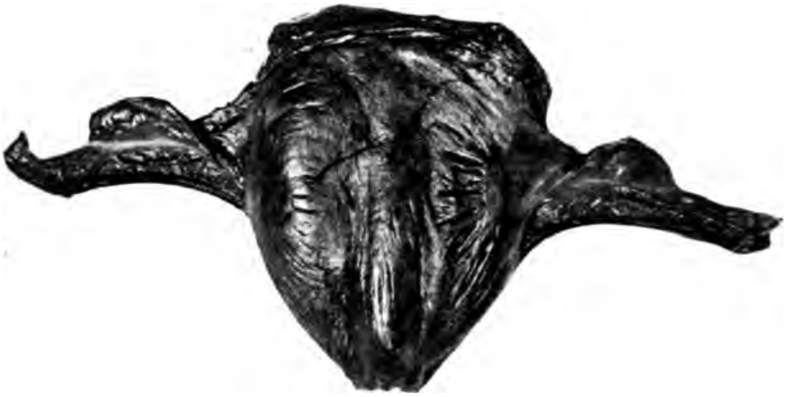
Fernwald: Archiv. f. Gynäkologie, Bd. lix, Heft 2, 1899.
Pinard: Annales de Gynécologie, August and September, 1899.
Leopold: Münchener medicinische Wochenschrift, No. 34, 1899.
Krönig: Centralblatt für Gynäkologie, No. 24, 1901.
Reynolds: Obstetrics, January, 1900.
Jewett: Brooklyn Medical Journal, October, 1900.
Zinke: American Journal Obstetrics, Nov., 1903.

CHAPTER IX.

CŒLIOHYSTERECTOMY, INCLUDING PORRO'S OPERATION; THE COMPLETE REMOVAL OF THE UTERUS.

Cœliohysterectomy.—By cœliohysterectomy is understood abdominal incision followed by amputation of the body of the uterus at the junction of the lower uterine segment with the cervix. By Porro's operation is understood amputation of the uterus, leaving the stump outside the peritoneal cavity and fixing it at the lower end of the abdominal incision. By complete removal of the uterus we understand the ligation of the ovarian and uterine arteries, the dissection of the uterus from the vagina and from the connective tissue of the bladder and rectum and the removal of the complete organ. The tubes are usually removed with the uterus; one or both ovaries may be removed or left behind as the operator decides.

FIG. 213.



Uterus, tubes and ovaries.
Hysterectomy for contracted pelvis, with intrapelvic treatment of the stump.

Indications.—The indications for cœliohysterectomy are so great a disproportion between the head and the pelvis that delivery cannot be accomplished by symphysiotomy or by forceps. The choice between cœliohysterotomy and cœliohysterectomy will depend upon the decision of the operator to allow the patient to undergo the risks of a future labor or to render such danger impossible.

If subsequent pregnancy is not to be avoided, then cœliohysterotomy is indicated. If, however, the power of conception is to be removed, then cœliohysterectomy is to be performed. Cœliohysterectomy is indicated in cases where the uterus contains fibromata and where pregnancy is also present. The choice between cœliohysterectomy and amputation of the uterus by Porro's method depends upon the skill and experience of the operator and the condition of the patient. Amputation of the uterus by Porro's method can be performed very simply and rapidly, and, if the operator has not had practise in hysterectomy for other conditions, and if the patient is not in such a state that hysterectomy will be well borne, then amputation of the uterus by Porro's method will give the best results. When the uterus is infected and the operator is not experienced in hysterectomy, Porro's operation will deliver the patient and remove the larger part of the septic uterus in the most rapid and simple manner.

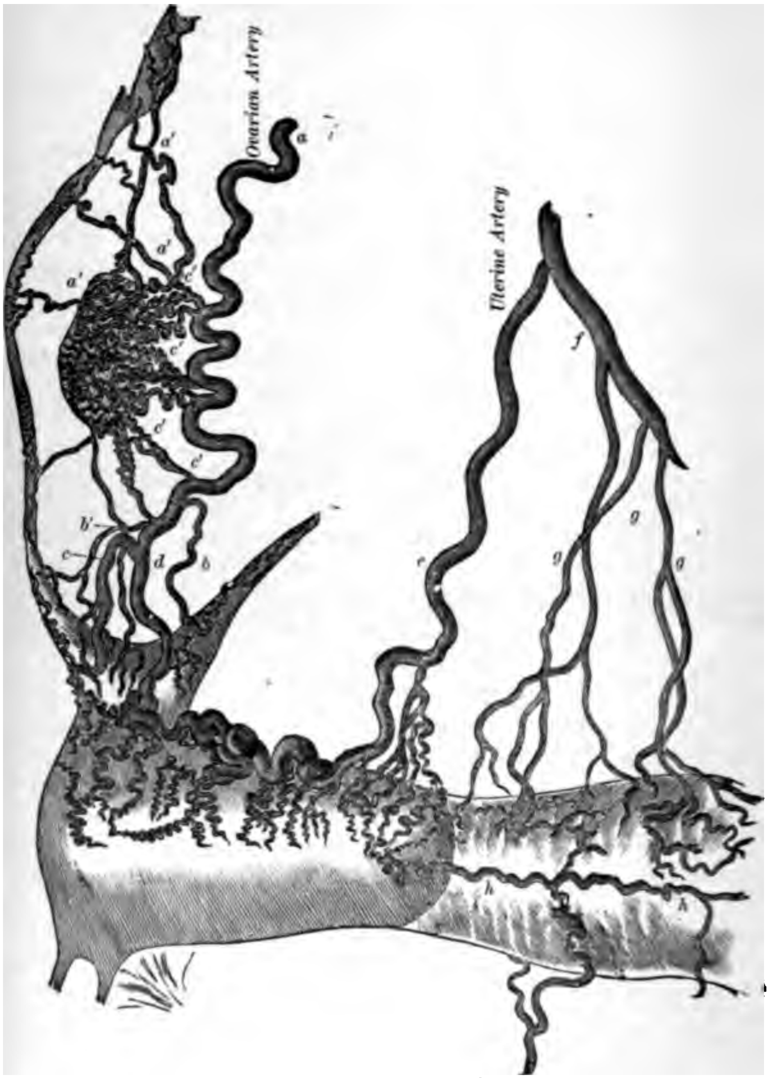
Time for Operation.—In cœliohysterectomy there is no advantage in waiting for the first stage of labor, as hemorrhage is controlled by ligature of the arteries, and hence there is no need for uterine contraction. Sufficient dilatation of the cervix should be procured to permit the slight discharge which passes from the stump in these cases. With this exception the operator may select the time for operation without regard to labor.

Preparation.—The patient should be prepared for the operation in the manner described in treating of cœliohysterotomy. It is indispensable that the operating table should have an apparatus for placing the patient in the Trendelenburg posture, as this is necessary in ligating the arteries at the bottom of the pelvis. The operator will require a large scalpel, a dozen pairs of hæmostatic forceps, two blunt-pointed curved needles on long handles, Chinese silk of good size and also fine; scissors and needle forceps, curved needles and suture material, including catgut, silkworm gut; several pairs of large forceps for clamping the broad ligaments are also useful. Some operators find clamps used in vaginal hysterectomy convenient.

Method.—The abdomen having been opened, the patient being in the Trendelenburg posture and the uterus delivered through the abdominal incision, a large soft towel thoroughly sterilized and wrung out of hot water, is placed behind the uterus and over the intestines. While the chief assistant controls hemorrhage, the uterus is rapidly incised and the child and its appendages removed. Up to this point the operation has not differed from cœliohysterotomy, commonly known as Cæsarean section.

Instead, however, of closing the uterus by suture, the operator then proceeds to ligate the ovarian arteries and the broad ligaments, clamping the ligament next to the uterus with suitable forceps and cutting through the broad ligament along the external edge of the forceps. In the pregnant patient the bloodvessels of the pelvis are greatly enlarged. The arteries can be plainly felt, while the veins are clearly evident. The ligation of the ovarian arteries is comparatively simple. The arteries of the round ligaments also require suture. Especial care, however, is needed in ligating the uterine arteries where the vessels pass in at the upper border of the cervix. It is well to grasp the vessel in the thumb and finger, passing the ligature from without internally and keeping the point of the needle as closely as possible to the uterus. It must be remembered that the ureter may be ligated in passing this ligature, and caution must be used in directing the needle toward the uterus. The ureter can usually be felt, like a large whipcord, beneath the fascia. When the ligatures have been passed and cut short, the uterus is to be freed from the broad ligaments down to the upper border of the cervix and

FIG. 214.

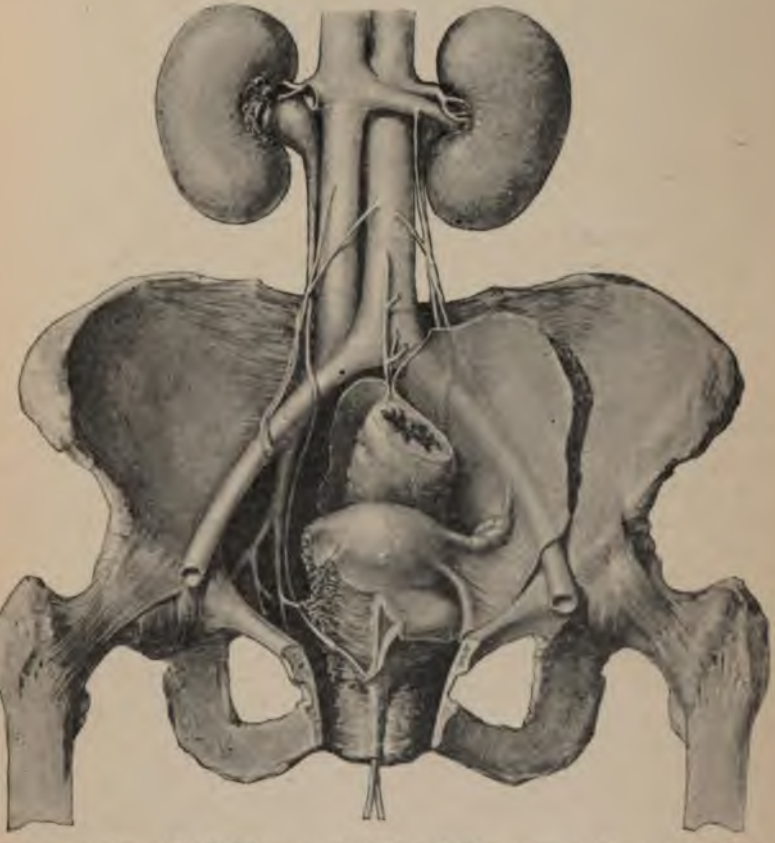


The ovarian, uterine, and vaginal arteries. (HYRTL.)

a. Ovarian artery. *a'* and *b'*. Branches to tube *b*. Branch to round ligament. *c*. Uterine artery. *c'*. Branches to ovary. *g*. Vaginal artery. *h*. Azygos artery of vagina.

the lower edge of the lower uterine segment. The uterus is then to be amputated at the junction of the cervix with the lower uterine segment. If bleeding points are left in the stump, they should be seized with forceps and ligated with fine silk. If the stump oozes freely, silk sutures may be buried in the muscular and elastic tissue, and covered by the peritoneal flaps. The flaps of the peritoneum which are left on the anterior and posterior surfaces of the stump must be brought together by a firm, continuous suture of fine silk or catgut and the abdomen closed by continuous suture of the peritoneum and interrupted stitches in the muscles and skin. As the operation is an aseptic one, no drainage is required in uninfected patients.

FIG. 215.

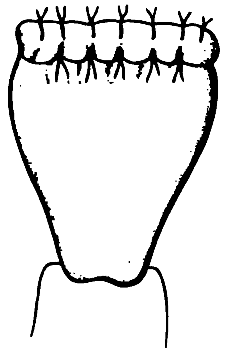


Peritoneum of one side of pelvis removed to show bladder, uterus, uterine artery and ureter. Bougies inserted in the ureters, illustrating the danger of wounding ureter in hysterectomy. (CLARK, Johns Hopkins Bulletin.)

Convalescence.—The recovery of these patients is usually attended by no serious complication. Lactation may be delayed, but should ultimately be established successfully. The dressing should not be removed for two weeks, and the case should be treated as usual with abdominal section. It is well to move the bowels thoroughly soon after the operation and to retain the stitches in the abdominal wound as long as possible.

There is little lochial discharge in these cases, as the uterus has been removed and there are no torn surfaces in the birth-canal.

FIG. 216.



Closure of stump after cœliohysterectomy. (ZWEIFEL.)

A discharge of blood-stained mucus may persist in these cases for a few days, occasioned by oozing from the cervix mingled with a discharge of the enlarged glands of the cervical mucous membrane. This, however, soon ceases and requires no attention beyond the use of an occasional antiseptic dressing. Douching is unnecessary in these cases and might possibly be productive of harm.

FIG. 217.

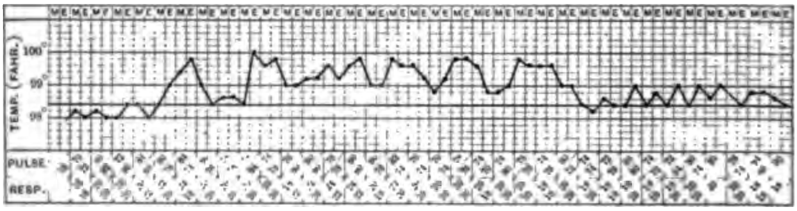


Chart.—Primipara, contracted pelvis, double hip-joint disease with partial ankylosis of lower extremities. Multiple interstitial fibromata. At the request of the patient and her husband, cœliohysterectomy was performed. Mother and child made uninterrupted recovery, the mother nursing her child.

Advantages of Cœliohysterectomy.—The advantages of this operation over cœliohysterotomy are the facts that it renders further conception impossible; that it controls hemorrhage by ligation of the ovarian and uterine arteries; and that it leaves the pelvis in the best possible condition for prompt recovery of the patient.

While experience with this operation has not been so extensive as

FIG. 218.

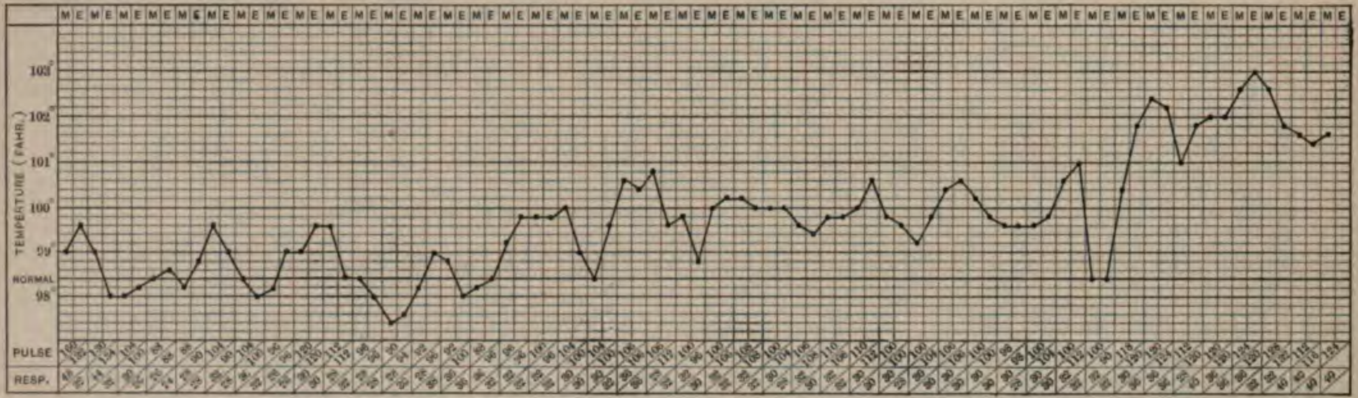


Chart.—Multipara, who had lost a number of children by version and forceps. Contracted pelvis, had been some time in labor. Forceps had been unsuccessfully applied. Patient admitted suffering from shock and hemorrhage. Craniotomy unsuccessful; delivery effected by Porro's operation; patient made complete recovery.

with Cæsarean section or Porro's operation, still its results have been so good as to indicate that it is the best form of delivery by abdominal section when future pregnancy must be avoided.

Porro's Operation (Cœliohysterectomy with Extraperitoneal Treatment of the Stump).—Porro's operation is performed by abdominal incision, delivering the uterus through the abdominal wall and controlling hemorrhage by passing a wire or rubber loop about the cervix, transfixing the stump with long pins, emptying and amputating the uterus, and leaving the stump in the lower end of the abdominal incision. Hemorrhage may also be controlled by the use of clamps which are wrapped in gauze and allowed to remain until the stump separates by sloughing.

The tubes and ovaries are drawn up and removed with the uterus, as is the case in cœliohysterectomy.

Some operators prefer to check hemorrhage by passing a solid rubber cord about the uterus at its neck, drawing it tightly, and transfixing the cervix with two knitting-needles passed at right angles to each other. In using the wire loop the wire should be placed around the cervix and the screw tightened, while the transfixing pins should be thrust through the stump at right angles to each other. The peritoneal surfaces of the abdominal incision are closed by continuous catgut suture, and the suture is carried through the peritoneal covering of the stump around its entire circumference. By this means the stump is shut off from the abdominal cavity and the danger of infection is greatly lessened. The abdominal wall is then closed by interrupted sutures down to the stump. The cut surfaces of the stump are powdered freely with iodoform. Some operators prefer to sear the stump with Paquelin's cautery or to cauterize with a strong solution of carbolic acid. A heavy antiseptic dressing is applied over the stump. As a rule, the stump will slough in from ten days to two weeks, leaving a depressed and granulating surface which will gradually close.

Advantages of Porro's Operation.—The advantages of Porro's operation are simplicity and rapidity of execution. The disadvantages are leaving cut and open surfaces of the stump through which infection may enter, and also the fact that hemorrhage is less perfectly controlled than by ligation of arteries. Cœliohysterectomy is so far superior to the Porro operation that the former should be employed whenever possible.

Porro's operation is especially valuable in cases where the uterus is infected, where the pelvis is so small that delivery through the vagina is impossible and where the patient is in such a condition of shock that rapid delivery is imperative. In uninfected cases, Porro's operation should not be selected.

Mortality.—The maternal mortality in cœliohysterectomy when performed by experienced operators and in good hospitals must be a low one. A sufficient number of these operations have not yet been performed to furnish a comparison with the more familiar methods of abdominal delivery. The mortality rate of Porro's operation depends very largely upon the condition of the mother and the skill of the operator in controlling hemorrhage. Unless care be taken, secondary hemorrhage is likely to occur and may prove rapidly fatal.

The mortality rate for children is essentially the same with each operation, and is a very low one. The most common cause of death among children in these cases consists in the bad effect of prolonged labor before the operation is actually undertaken. In well-selected cases and in good hands cœliohysterectomy furnishes one of the most efficient operations in obstetric surgery.

After-Treatment and Care of the Child.—In the after-treatment of these cases caution should be observed not to abandon the hope of successful lactation, as the patient, if not a strong woman, may suffer sufficient shock to delay the formation of milk for several days. The child should be put to the breast, however, several times a day, and the breasts should be pumped at regular intervals to stimulate the formation of milk. Success may be achieved as late as a week after the delivery of the child. Children delivered by these operations are often partially asphyxiated and require resuscitation.

The asphyxia seen in children born by this operation does not resemble that observed in difficult labor, but is more like a physiological apnœa. As no violence whatever is done to the fœtus until the moment of its extraction, and as its removal from the uterus requires but a moment, the fœtal blood is not poor in oxygen in these cases, nor is it charged with carbonic acid. It is fully oxygenated through the placental circulation, and hence the fœtus will not breathe until it is separated from the uterus and has exhausted the oxygen already contained in the blood at the moment of extraction.

No prolonged efforts are needed in these cases to bring about vigorous respiration.

If the delivery has been quickly accomplished, the child will not have inspired fluid from the uterus, and hence will be more easily brought to breathe.

In cœliohysterectomy the abdominal stitches should be retained as long as possible. The patient should not sit up until three or four weeks have elapsed; an abdominal belt should be worn for some time. Final recovery from Porro's operation is much longer than from cœliohysterectomy. The stump separates by sloughing, and the depression usually left must be filled by granulation. During this time infection may occur unless the stump is treated antiseptically.

Entire Removal of the Uterus.—In cases where the uterus is infected when abdominal section is performed the patient will have the best opportunity for recovery if the uterus be treated like a malignant tumor and entirely removed. If the fœtus is dead and partially decomposed, it is better not to open the uterus, but to remove the uterus without emptying it. The broad ligaments are to be ligated and cut; the uterine arteries must then be tied, and the uterus dissected from its attachment to the vagina. Antiseptic gauze should be placed in the pelvis, and, if possible, the pelvic peritoneum be brought together above the gauze. If this cannot readily be done, the gauze itself may serve to close the lower extremity of the abdominal cavity. The end of the gauze is brought out into the vagina and may be gradually removed, as is done after total extirpation of the cancerous uterus by abdominal section. If the abdominal cavity be freely flushed with hot saline solution, the abdomen should be closed without drainage, the gauze in the vagina providing for such drainage as is necessary.

Although this is naturally a grave operation, its mortality arises chiefly from the fact that occasion to perform it rarely arises except upon patients exhausted by fruitless labor and already thoroughly infected. Where the pregnant and cancerous uterus is removed in the same manner at or near term the recovery of the patient from the operation is not infrequent. Such patients require the utmost stimulation and careful feeding. The bowels should be moved by small doses of calomel followed by saline, or saline injections, and all the resources known to surgery should be employed to tide the patient over the first development of shock after the operation. If the case has been taken in time, it is possible for such a patient to recover.

Vaginal Cæsarean Section.—Under this term, Dührssen describes a method of emptying the uterus by vaginal incision. The bladder is separated from the uterus by an incision at the anterior junction of the uterus with the vagina. The uterus is then opened by an incision through the lower uterine segment and access is thus gained to the cavity of the womb. The womb is then emptied by the use of the finger and curette if the pregnancy should be an early one or by version if the pregnancy be later. If the cervix is sufficiently dilated a packing of iodoform gauze is introduced, which is brought out through the cervical canal. Care is taken to thoroughly empty the uterus. The incision is then closed by chromicized catgut and also the incision opening the vagina.

Dührssen applies this method of operating to cases of eclampsia in which the cervix is tightly closed and the necessity for rapid delivery arises; to cases of tumors obstructing the pelvis, and to pelvic deformities in which abdominal section is declined and in which interference is permitted when the fœtus is sufficiently small to pass through the cavity. The essential reason for choosing this method of operation is found in a resisting and undilating condition of the cervix with immediate necessity for the termination of pregnancy.

So far this operation has proven successful in the hands of Dührssen and some others. It has not met with general adoption and its merits cannot at present be definitely stated.

CHAPTER X.

EMBRYOTOMY.

By embryotomy is understood a reduction in the size of the fœtus by cutting or crushing any portion of the fœtal body. As the head of the child commonly presents, and as it usually offers the greatest obstacle to delivery, some cutting or crushing operation upon the cranium, called craniotomy, is most frequently performed. Embryotomy is one of the oldest of obstetric operations, and its abuse led to remonstrance on the part of religious authorities and to the prohibition by some churches of the performance of this operation upon the living child. The improvement in obstetric surgery has gradually diminished the frequency of embryotomy and greatly narrowed its field. It remains, however, a proper procedure in certain cases, and one which, addressed to the interests of the mother only, may often serve a most useful purpose.

Embryotomy is sometimes performed unwittingly by the use of forceps. A physician who has no knowledge of pelvimetry, and is therefore ignorant of the size of the pelvis in a case which he is attending, may find the head presenting, the parietal bone being lowest at the pelvic brim; and, mistaking this condition for engagement, he may apply the forceps and by strong traction endeavor to deliver; he will not succeed, however, in such a case, but will bruise and fracture the cranium, destroying the life of the child: this is craniotomy, although not a deliberate and premeditated embryotomy. Again, the head of a child may be born, and unusual size of the shoulders may prevent further delivery. Efforts to bring down the shoulders may result in fracture of the clavicle on one or both sides; this may also be styled embryotomy, although not deliberately chosen.

Indications.—In the present state of obstetric surgery embryotomy is clearly indicated in but two conditions: first, when a fœtus larger than the birth-canal is dead when the physician first sees the case; and, second, when the presence of a monstrosity is diagnosticated. In either of these events embryotomy is clearly indicated. When a living and uninjured child is contained within the womb of a patient whose pelvis is too small to permit normal birth, embryotomy is contra-indicated, and some other obstetric operation which offers a reasonable chance of saving the child's life must be selected.

While such is the duty of the modern obstetrician, he may at times be placed in circumstances where he is not at liberty to follow strictly such a line of procedure. As in the time of Napoleon, so at the present day the law prevails that the interests of the mother must always take precedence during confinement. Exactly how far she is at liberty to choose to sacrifice the life of her fœtus is a question difficult to determine. Another complicating factor lies in the very differing conditions under which physicians are placed in their various fields of practise: thus, an obstetrician residing in a city may decline to perform embryotomy upon a living child, knowing well that some other legally qualified practitioner can always be found without difficulty who may undertake the operation. He may properly transfer the case, if he so desires, to some one else. On the contrary, the physician who practises outside of cities may find himself alone in the presence of a complicated confinement where an obstetric operation is demanded to save the lives of mother and child. The parents and friends may decline this operation, and insist upon embryotomy. If no physician but himself is available, and the mother's interests are clearly in danger, he must, under remonstrance, yield to his patient, if he cannot obtain her consent to follow his judgment. It has been proposed by some that the physician should delay the case until the child has died from prolonged birth-pressure, when he may perform embryotomy without compunctions: this procedure is so dishonest to the interests of mother and child that it is unworthy the attention of reputable men. The rights of the fœtus should be distinctly protected by the medical practitioner.

In securing the consent of the patient and her family to perform some life-saving operation instead of embryotomy, the practitioner at times can procure considerable aid if the counsel of a clergyman can be invoked; among certain denominations embryotomy is prohibited or deprecated, and such a clergyman may be able to persuade the parents against the operation when the physician alone could not prevail.

Prognosis.—Embryotomy is sometimes selected upon the erroneous belief that it is always less dangerous to the mother than Cæsarean section; this error has cost more than one maternal life. In highly-contracted pelves embryotomy is more dangerous to the mother than Cæsarean section performed under favorable conditions. It is far more difficult and dangerous to extract a large fœtus piecemeal through a highly-contracted pelvis, than to remove the same by abdominal incision. Not only is the danger of sepsis far greater, but severe injury to the bladder may occur, and also extensive laceration of the soft parts of the birth-canal.

Like all other operations, it is evident that the success or failure of embryotomy must depend largely upon the condition of the mother at the time of operation. Unfortunately, most embryotomies must be performed in cases where the patient is already exhausted through prolonged and ineffectual labor. Many of these cases have already been infected before coming under observation: hence, puerperal septic infection readily develops in the bruised and lacerated birth-canal, and severe constitutional poisoning rapidly ensues.

Those methods of performing embryotomy which tend to injure the mother's tissues as little as possible are obviously safest and most successful. When the fœtal skeleton is severed care must be taken that no fragments of bone emerge from the soft parts to wound the maternal tissues. In cases where fruitless attempts at delivery have not already bruised and lacerated the mother's tissues, embryotomy is most successful. The prognosis of such an operation must, therefore, depend not only on the degree of pelvic contraction and the skill of the operator, but also upon the condition of the mother's tissues before the operation is attempted.

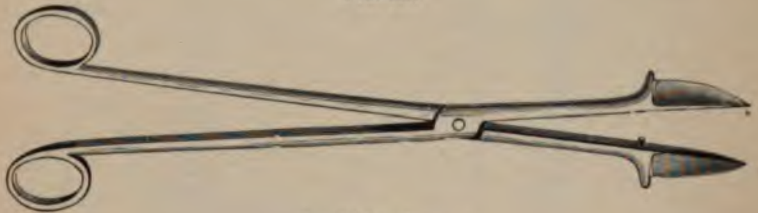
The various procedures employed in performing embryotomy may be described in connection with various portions of the fœtal body.

CRANIOTOMY

Consists in opening the fœtal cranium and allowing a portion of its contents to escape, and then subjecting the head to pressure in such a manner as to lessen materially its circumference.

Method of Operating.—Craniotomy may be done in two ways: one, by opening the head through a suture or fontanelle, without removing a portion of the bony wall; and the other, by entirely removing a disk of bone and thus making a permanent opening in the skull.

FIG. 219.



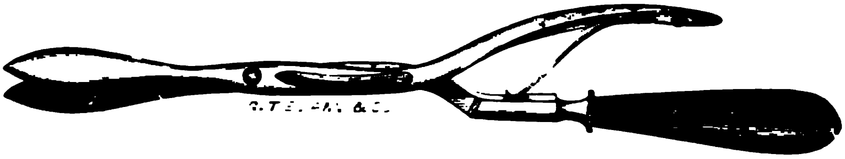
Smellie's scissors.

In the former, a pointed instrument is thrust into the cranium through a suture or fontanelle. A suitable forceps for making traction upon the head is then applied, one blade being inserted into the opening in the skull, while the other blade grasps the cranial wall from without. Traction is then made upon the head, which is compressed by the pressure exerted by the pelvic wall. A small portion of the cranial contents may escape through the opening made, while the greater portion of the brain will simply be compressed and bruised within the cranium. When the disproportion existing between the head and the pelvis is slight, sufficient compression of the skull may thus occur to permit of delivery. When, however, the pelvis is much smaller than the head, this procedure will scarcely be followed by sufficient reduction in the size of the fœtal cranium to make a material difference in delivery. Where the fœtus is small, or where the head is easily compressible, or the fœtus is macerated, the obstetrician may hook his finger into the cranium through the opening made, and by gentle but persistent traction may deliver the child. If no suitable forceps be at hand, any blunt hook may be passed within the skull, and traction made in that way.

It is often the case that the head is not so situated that a suture or fontanelle is available for craniotomy. In contracted pelves, and especially in flattened pelves, a parietal bone usually presents at the brim of the pelvis. About the centre of this bone is the most available point of the cranium for the performance of craniotomy.

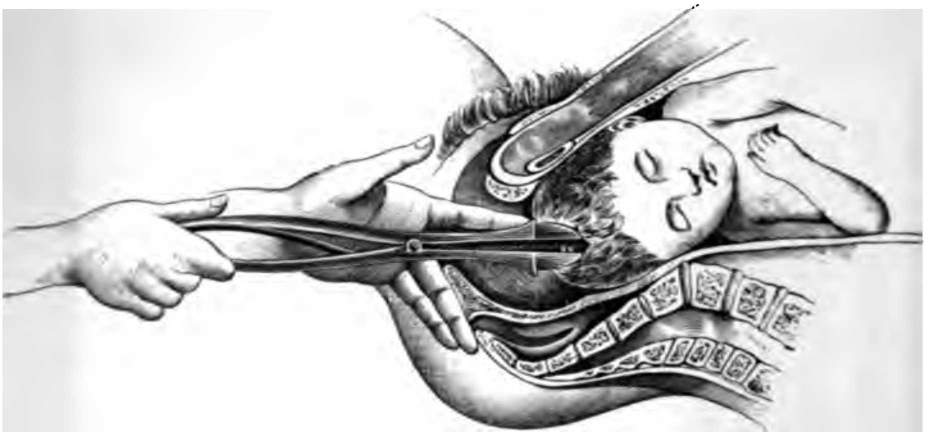
The bony tissue of the skull may be opened by a pointed instrument, the blades of which may be separated after they have been inserted into the skull, thus cutting in several directions through the cranial wall. An excellent example of such an instrument is found in Blot's perforator, which is shaped somewhat like the point of a spear, the edges of the blade opening and cutting several flaps into the cranial wall. Through this opening a suitable traction forceps may be inserted for the delivery of the head.

FIG. 220



Blot's perforator

FIG. 221



The use of the simple perforator.

A more efficient method, however, consists in the use of the obstetric trephine: this is essentially the trephine of the surgeon, placed upon a longer stem to enable the obstetrician to reach upward to the brim of the pelvis. As the scalp is often swollen and œdematous in these cases, it is sometimes necessary to incise the scalp, and through such an incision to apply the trephine directly to the periosteum covering the bone. Usually, however, the centre-pin of the

FIG. 222.

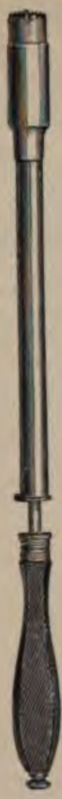
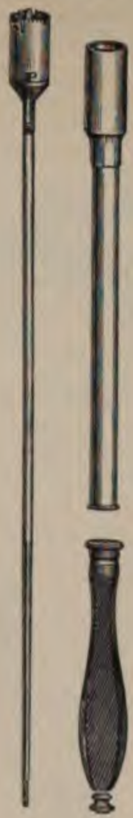
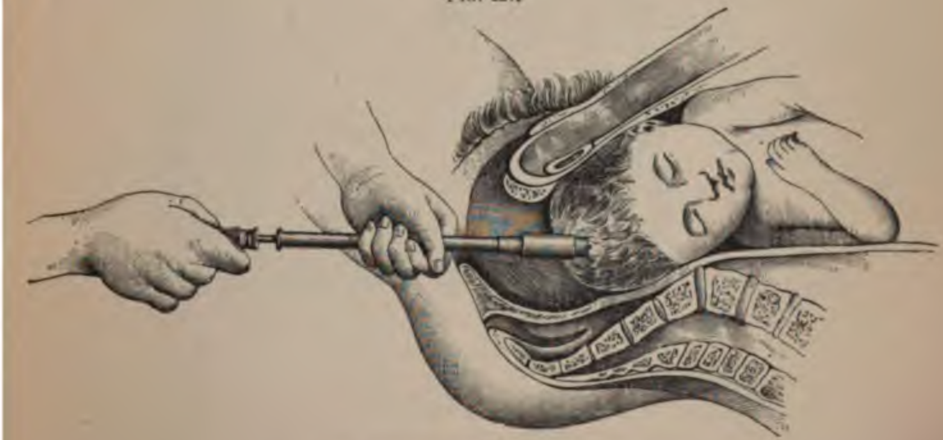


FIG. 223.



Martin's trephine.

FIG. 224.

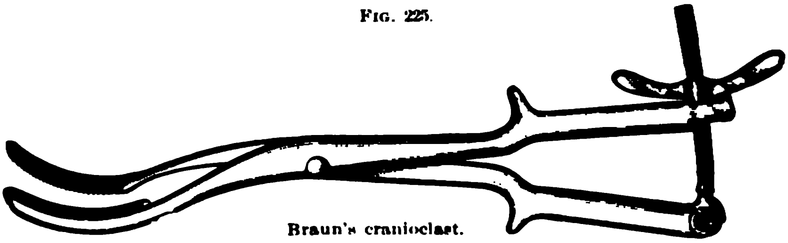


Craniotomy with Martin's trephine.

trephine may be thrust directly through the scalp and the periosteum, and the blade be brought directly down upon the bony tissue.

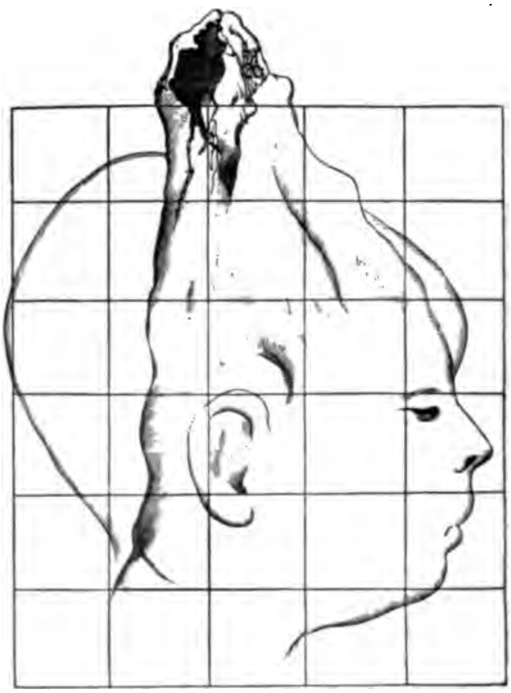
While the trephine, however, may remove a button of bone from the cranial wall, it does not remove the cranial contents nor lessen the size of the head. When the head has been opened, it is best to thoroughly break up the brain and its membranes with a blunt instrument, and then with a strong piston-syringe to wash out the cranium with a dilute antiseptic solution; when this has been accomplished, one blade of the cranioclast is to be passed through the opening, while

FIG. 225.



Braun's cranioclast.

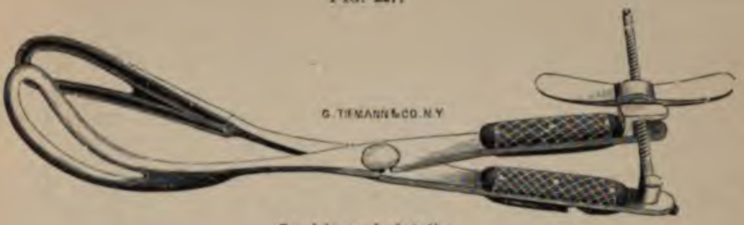
FIG. 226.



The head after delivery by the cranioclast.

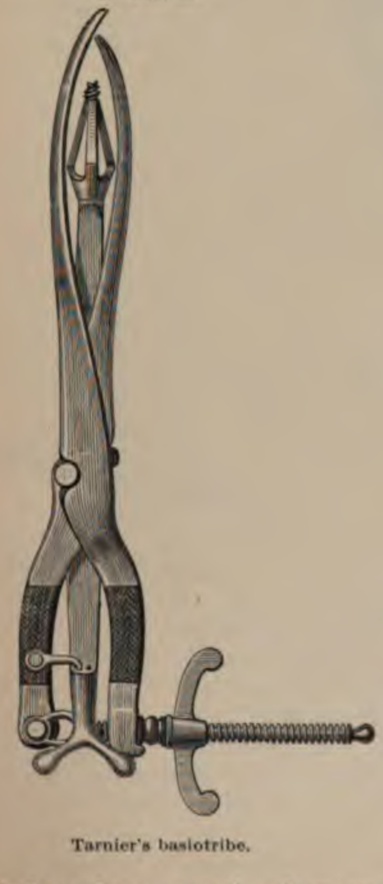
the other is applied to the external surface of the cranium. The cranioclast is then firmly locked, and traction is made downward and backward in the axis of the pelvic brim until the pelvic floor is reached, when traction is continued upward and forward. The best cranioclasts have a perineal curve similar to that of the forceps, which aids materially in making traction in the proper direction.

FIG. 227.



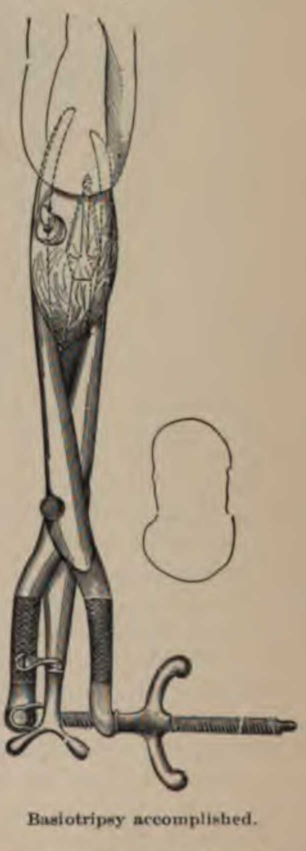
Lusk's cephalotribe.

FIG. 228.



Tarnier's basiotribe.

FIG. 229.



Basiotripsy accomplished.

Neither trephine nor cranioclast, however, lessens the size of the head: this must be accomplished by pressure by the pelvic walls during the descent of the head. If the cranium be unusually hard, it may be impossible so to lessen its size without exposing the mother's soft tissues to violence and injury. In these cases the head must not only be emptied, but also fully or partially crushed before traction is made.

CRUSHING OPERATIONS.—Instruments designed to crush the head are called cephalotribes. They consist essentially of a pair of stout forceps, with a strong compression-screw at the outer extremity of the handles. The instrument is applied in the most convenient manner possible to the sides of the head, the tips of the blades reaching beyond the fetal cranium. By applying a compression-screw the skull is then crushed; and if it is essential to thoroughly break it up,

FIG. [illegible].

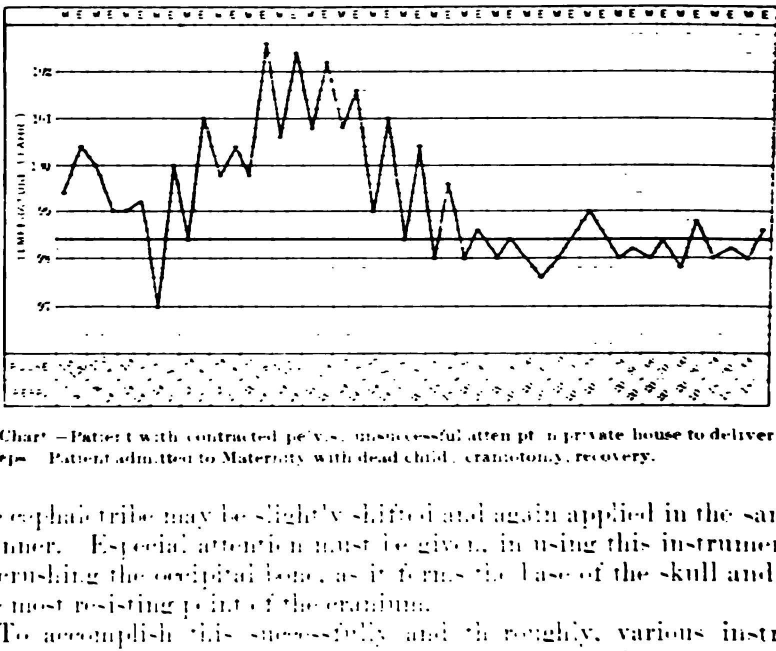


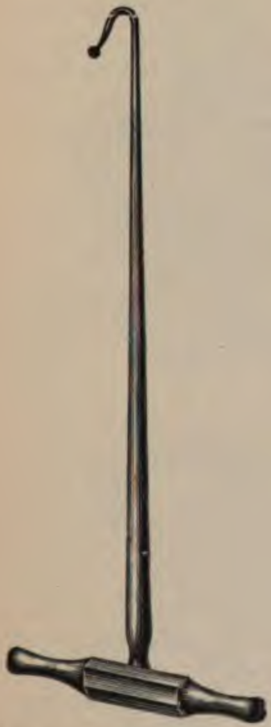
Chart.—Patient with contracted pelvis; unsuccessful attempt in private house to deliver by forceps. Patient admitted to Maternity with dead child; craniotomy; recovery.

the cephalotribe may be slightly shifted and again applied in the same manner. Especial attention must be given, in using this instrument, to crushing the occipital bone, as it forms the base of the skull and is the most resisting point of the cranium.

To accomplish this successfully and thoroughly, various instruments have been invented, some of which have portions especially designed to crush the occiput. Such are called basiotribes, and best known among them are the instruments of Tarnier, and also that of Auvard. These instruments have a long centre-stem or core, terminating in a screw thread somewhat like that of an auger. The centre-point is bored through the cranial wall and directly into the base of the skull. When the head has been thus entered, the blades of a cephalotribe are applied upon each side of the skull, and the cranium thoroughly broken up. Extraction is then performed in the usual manner.

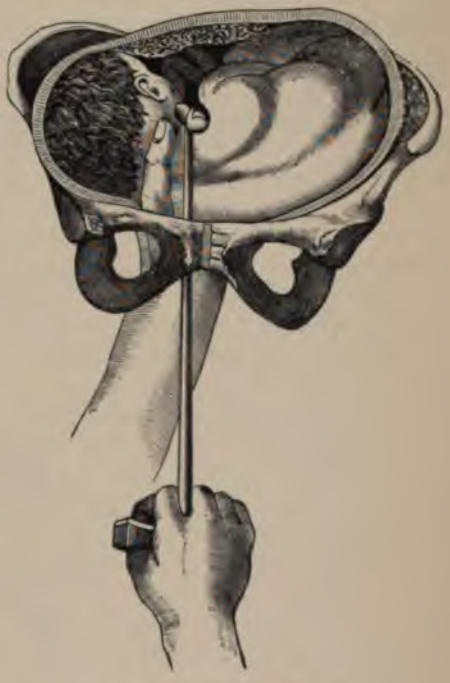
DECAPITATION.—In impacted transverse presentations of the fœtus it may be necessary to decapitate the child: elaborate instruments for this purpose have been devised. As is the case with all surgical instruments, the simplest instruments and apparatus for decapitation are most efficient and safest. Some have advised passing a simple cord or band around the neck of the fœtus, and severing the neck by sawing through the tissues with the cord: the difficulty of this procedure lies in the fact that it often requires skill and patience to pass a cord or band around the fœtal neck. The simplest instrument which has been found most efficient is the decapitation-hook of Braun; this consists of a long stem, having at one extremity a blunt hook, and at the other a transverse handle. The hook is fastened over the neck of the child, and by a steady, twisting motion the vertebral column is severed. Modifications of this hook which carry a chain-saw or a cutting-band about the neck of the fœtus have been devised, but they are complicated and elaborate, and objectionable for these reasons. Zweifel finds an objection to Braun's hook because the fixed point on which leverage is exerted is placed upon the child's neck by this hook; Zweifel urges that this point should be at the hand of the operator,

FIG. 231.



Carl Braun's decapitation hook.

FIG. 232.



Decapitation by the hook.

and for this purpose he has devised double hooks, joined, which can be rotated in such a manner as to bring the fixed point of force upon the stem and handle of the hooks. He appends to his description of these hooks a report of several cases; in one of these, an assistant had attempted decapitation, but had omitted the very important precaution of grasping the neck of the child with his index and middle fingers, and carefully determining the fact that the hooks were accurately applied to the child's neck. The failure to take this precaution had resulted during the decapitation in wounding the neck of the womb so extensively that profuse hemorrhage followed, and death from acute anæmia.

FIG. 233.

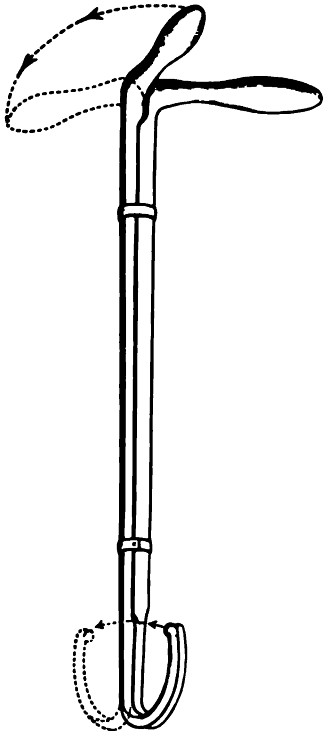
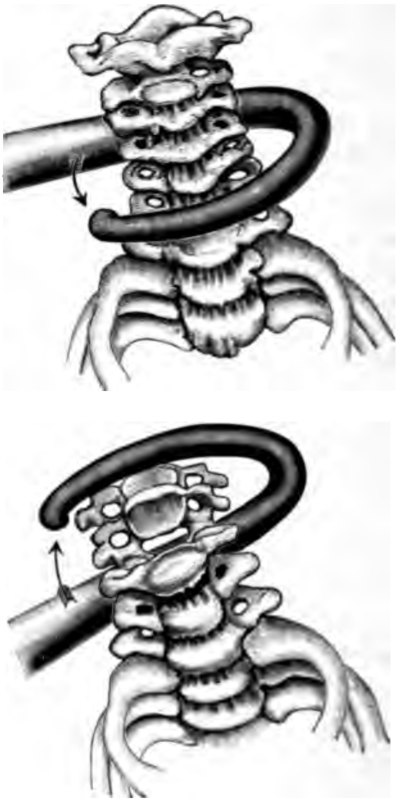


FIG. 234.



Decapitation by Zweifel's hooks.

Tarnier's *embryotome* for decapitation consists essentially of a hook carrying a sheathed, linked saw, which is gradually tightened after being placed in position: it is possible with this instrument to sever the trunk of the fœtus at any portion, should it not be possible to reach the neck of the child. Where the fœtus is large and firmly impacted, considerable difficulty may be experienced in performing decapitation with a hook. In such cases Thomson has had good results by using the sickle-shaped knife of Schultz: in eleven cases this knife, which must be very sharp to be efficient, worked rapidly and very easily.

When the maternal tissues are relaxed and the child is not large, should impaction occur during twin delivery, it may be possible to decapitate a child born in breech presentation by a strong pair of blunt-pointed scissors; if there is danger that the mother's tissues may be wounded, a piece of rubber tubing may be passed about the neck of the child, serving as a guard to prevent the scissors from slipping up into the uterus. Thus, in a case of locked twins, in which the body of one had been born, while the two heads were impacted at the pelvic brim, the writer decapitated one of the children readily by this expedient.

REDUCTION OF THE TRUNK.—For attacking other portions of the fœtus besides the head, the simplest instruments are most successful. A strong-bladed pair of blunt-pointed scissors is an especially valuable instrument; with these, the clavicles may be severed, a fœtal limb may be amputated, or the fœtal neck cut asunder.

In cases of excessive development of the shoulders great difficulty may be experienced in bringing this portion of the child's body through the pelvis. If the clavicles be severed, the trunk is instantly greatly reduced in transverse measurements, and delivery is usually possible. Phänomenoff[220] has severed the clavicles in such cases by the use of large, blunt-pointed scissors. He inserts one hand sufficiently far to grasp the clavicle with the thumb and fingers, and, with these as guides, cuts through the bone with strong scissors. While, theoretically, it might be easier to sever the articulations between the clavicle and sternum, still, practically, no difficulty is experienced in severing the bone in the manner described. Phänomenoff styles this operation cleidotomy.

In neglected transverse presentations in which the fœtus has become impacted, evisceration is often demanded before delivery can occur. In these cases Mermann[221] has succeeded by cutting through the ribs with scissors, and emptying the chest and abdomen with the hand.

Craniotomy on the After-Coming Head.—The after-coming head may lodge at the pelvic brim, or within the pelvis, and may demand craniotomy. Numerous procedures are recommended in these cases: some advise that the head be opened through a fontanelle (Busch); others advise that the *foramen magnum* be opened (Michaelis); while Kilian would make section through the soft parts beneath the chin, and insert a trephine through the base of the skull. Cohnstein would open the vertebral canal and push a catheter into the cranium. Donald would perforate through the base of the skull by way of the mouth, and Dührssen would open the vertebral column through the *foramen magnum*. Strassmann[222] fixed the head by introducing the index and middle fingers into the open mouth, and making traction upon the lower jaw. The breech of the child was elevated toward the mother's abdomen. A scissor-perforator was then passed through the pharynx to the base of the skull through the *foramen magnum*, dividing the bones between the occipital condyles and making a large opening. A firm catheter was then introduced, and the brain broken up and washed out. Traction with the finger in the fœtal mouth was sufficient to accomplish delivery. This method is urged as requiring no assistant, and being especially safe. Macan[223] makes an extensive review of the literature of perforation of the after-coming head, and draws attention to the safety of perforating through the mouth of the fœtus. In a case of hydrocephalus in breech presentation, Lamarche succeeded by drawing the trunk of the fœtus well downward and to the left, opening the palatine vault with Smellie's scissors, and allowing fluid to escape from the cranium. Winternitz[224] was obliged to make decapitation in a case of breech presentation in a highly contracted pelvis. The head was turned by suprapubic manipulation, so that the occiput presented. It was then fixed by external pressure, the brain broken up and evacuated with the finger, and the head delivered by the cranioclast. The patient made a good recovery.

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[220] Phänomenoff: Centralblatt für Gynäkologie, No. 22, 1895.

[221] Mermann: Centralblatt für Gynäkologie, No. 36, 1895.

Unusual Complications.—It occasionally happens that after version in contracted pelvis the operator is obliged to do embryotomy, and that a portion of the fœtus may be retained within the uterus. Thus Touvenaint[225] was obliged to perform embryotomy after version, and extracted the fœtus piecemeal at intervals during three days: the patient resumed her usual occupation; but a vaginal discharge persisting, she consulted another physician, who found a uretero-vesical fistula. The skeleton of the fœtal head still remained in the uterus. The womb was dilated with tents, and the fœtal bones extracted by forceps. The patient ultimately made a good recovery. This case illustrates well the tolerance which the organism manifests to a retained and putrefying fœtus so long as streptococcus infection is not added to the complications already existing. The fœtus may become putrefied before delivery, and yet the mother be relieved and escape septic infection, a temporary sapræmia being often the only complication. This is illustrated by a patient delivered at the Jefferson Maternity, who had lain in labor in a tenement-house for several days, the child in transverse presentation and the arm presenting. On admission to the Maternity the arm was black and partly decomposed, and the shoulder and trunk formed a wedge at the pelvic brim. It was necessary to amputate the arm at the shoulder-joint, push up the child, and make version to deliver. The mother escaped with a mild attack of sapræmia, which yielded promptly to a single intrauterine injection.

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[222] Strassmann: Berliner klin. Wochenschrift, No. 36, 1894.

[223] Macan: British Gynecological Journal, No. 11, p. 608, 1895.

[224] Winternitz: Centralblatt für Gynäkologie, No. 28, 1892.

[225] Touvenaint: Centralblatt für Gynäkologie, No. 22, 1893.

Craniotomy and Symphysiotomy.—Craniotomy is occasionally requisite in connection with symphysiotomy. Dimock[226] performed symphysiotomy upon a Hindoo rhachitic dwarf; the patient's condition did not justify abdominal section, and the pelvic space was so small that embryotomy without symphysiotomy was impossible. The fœtus was dead before the operation. After the symphysis was opened the head was perforated and delivered by the cranioclast. The patient made a good recovery. It is evident that cases may occur in which the patient's exhausted state renders abdominal section unwise, and in which symphysiotomy must precede embryotomy. These cases, however, must necessarily be rare, and in many patients would prove fully as complicated and dangerous as abdominal section. Caruso,[227] of Naples, in the Eleventh National Congress at Rome, advises symphysiotomy in place of Cæsarean section where the fœtus is dead and the pelvis highly contracted. Pinard believes that when the child is dead symphysiotomy is only permissible when the pelvic contraction is so great that embryotomy, and especially the use of the basiotribe, is exceedingly dangerous. Morisani,[228] in a discussion upon symphysiotomy before the Congress of 1894, at Rome, would avoid symphysiotomy when the infant is dead, or in such poor condition that its life is a matter of great doubt. In such cases he would deliberately elect embryotomy, and views with considerable doubt the proposition to combine the two operations when the fœtus is in bad condition and the pelvis highly contracted.

Frequency.—The frequency with which embryotomy is performed by an operator or in a given clinic must depend considerably upon the usage of the person or the clinic. A physician accustomed to abdominal section and with the apparatus required for such cases would naturally operate in this manner upon many patients who might otherwise be delivered by embryotomy. Among the extensive statistics upon the subject are those of Potocki,[229] who examined the records of 32,938 births at the *Maternite* and *Lariboisière;* there were in these cases 151 shoulder presentations, in which version was done 119 times. Embryotomy was performed 12 times, and 20 patients delivered themselves by spontaneous evolution. Among shoulder presentations, one in four is neglected and comes to embryotomy. Nineteen embryotomies are reported by this author, with six deaths, one of which was directly caused by the instrument employed. Philips[230] performed 16 craniotomies, with a maternal mortality of *nil.* Ten of these were done upon living children. The smallest true conjugate was 2¾ inches. In several cases the pelvic brim was normal, but the outlet was contracted. Polland[231] reports 25 embryotomies, with maternal mortality of four, three cases dying of rupture of the uterus, and one from deep laceration of the vagina. Fourteen decapitations were made with the hook, and in three cases this instrument failed. Strong scissors succeeded where other instruments were unsuccessful. In 60 contracted pelves Guéniot[232] performed embryotomy but once, and then basiotripsy was employed in a case where the forceps failed to deliver. Kufferath,[233] in an extensive survey of induced labor, Cæsarean section, and embryotomy, would choose the last when the mother declined another operation, or when she was in such condition that her recovery from Cæsarean section would be a matter of grave doubt.

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[226] Dimock: British Medical Journal, No. 1695, 1893.

[227] Caruso: Centralblatt für Gynäkologie, No. 17, 1894.

[228] Morisani: Annales de Gynécologie et d'Obstétrique, April, 1894.

[229] Potocki: Thesis, Paris, 1888.

[230] Philips: British Medical Journal, June 1, 1889.

Prognosis.—In skilful hands embryotomy is a very safe operation. Leopold has done 71 craniotomies, with $2\frac{8}{10}$ per cent. mortality. (Kehrer,[234]). Fehling had $4\frac{3}{10}$ per cent. mortality in 23 craniotomies, with five deaths, two from previous rupture of the uterus, and three from eclampsia. Zweifel has never lost a case of craniotomy through the operation itself. The perforation of the after-coming head is more fatal to the mother. It is estimated at the Leipzig clinic that the ratio is about five to one. It is difficult to compare the records of European clinics upon embryotomy with those of the United States. It is only within recent years that pelvimetry has become sufficiently common to lessen the fruitless attempts at delivery in contracted pelves, which produce so great mortality. Edgar,[235] among 3,225 confinements at the Lying-in Hospital of New York, had but one embryotomy. Extreme degrees of pelvic contraction calling for embryotomy are less common in American clinics than in those of Europe.

Relation to Other Procedures.—In concluding the discussion on the subject of embryotomy, it is proper to review the grounds upon which a choice between embyrotomy, Cæsarean section, and symphysiotomy must be made in the present stage of obstetric surgery. As has been said, a physician practising where competent assistance can be obtained and antiseptic precautions observed is fully justified in absolutely declining to destroy the life of an uninjured and normally vigorous fœtus. If, however, he cannot command proper help and aseptic environment, he must consult the mother's interests first, and may then consent to embryotomy upon the uninjured child. In cases where ineffectual attempts have been made to deliver with forceps it is extremely probable, if not almost certain, that the fœtus has been so injured that its recovery is doubtful or impossible, and that the mother has been infected. The physician summoned to such a case must take these circumstances into account in deciding on operation. He may thus elect embryotomy, even if combined with symphysiotomy, rather than abdominal incision. It must, however, be remembered that if the womb is already septic and the patient's strength be good, it may be safer for her to deliver by abdominal section, followed by hysterectomy. In cases of rupture of the uterus the operator must first ascertain whether the fœtus cannot be removed through the vagina by embryotomy, if necessary. If the rent in the womb is but a partial or slight one, embryotomy should be performed, the uterus disinfected, and the rupture tamponed with sterile gauze. In cases of extensive rupture, with escape of the fœtus into the abdomen, abdominal incision is necessary.

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[231] Polland: Inaugural Dissertation, Berlin, 1895.

[232] Guéniot: Mercredi Medical, No. 18, 1895.

[233] Kufferath: Centralblatt für Gynäkologie, No. 46, 1892.

[234] Kehrer: Lehrbuch der Operativen Geburtshülfe, 1891.

[235] Edgar: American Journal of Obstetrics, Vol. 27, 1893.

Precautions.—It is of the utmost importance in cases of embryotomy that thorough antiseptic precautions be observed. After the removal of the fœtus the uterus must be thoroughly emptied. It should be copiously douched with lysol, or creolin, 1 per cent. Its cavity should be tamponed with iodoform gauze, and a lacerated cervix should be at least partially closed with chromicized catgut. Tears in the pelvic floor and perineum should also be sutured. The vagina should be tamponed with bichloride gauze, and the gauze dressing of the uterus and vagina should remain undisturbed for forty-eight hours. If injury to the bladder is suspected, permanent drainage by a catheter and long tube should be practised.

The operator must always remember that embryotomy is a most distressing procedure for the patient and her family. If possible, no member of the family should witness the operation. Under no circumstances should the mother see the child after its delivery. If possible, the scalp should be sutured, or other portions of the integument brought together, so that the sight of the fœtal body should be as little distressing as possible; a display of instruments for embryotomy is most unfortunate and ill-advised. Care should be taken that the brain be thoroughly broken up before the child is delivered. Distressing instances are on record where reflex movements of the fœtal limbs have led to a suspicion that the child survived the operation.

SECTION III.

THE SURGERY OF THE PUERPERAL STATE.

CHAPTER XI.

THE COMPLETE EMPTYING OF THE PUERPERAL UTERUS.

In obstetric surgery it is frequently necessary to empty the uterus, completely removing not only the fœtus, placenta, and membranes, but also as much of the decidual lining of the uterus as possible. In all cases in which a suspicion exists that septic infection has occurred or in which there is reason to believe that the lining membrane of the uterus is in an unhealthy condition, precautions should be taken to empty the womb thoroughly when labor is completed.

Manual Removal of the Placenta.—The placenta may be retained within the uterus by spasmodic contractions of the lower portion of the expulsive segment and of the lower uterine segment. This forms what was formerly described as hour-glass contraction of the womb, a not infrequent and annoying complication of labor. This frequently resulted from efforts to deliver the placenta by pulling upon the cord, which produced partial separation and excited uterine contraction. Since Crède's method of delivering the placenta has become widely established, these cases are rarely found. The placenta adheres abnormally to the wall of the uterus in very few cases; where a chronic endometritis has been present or an infection and inflammation of the decidua or in some cases of syphilis, the placenta may be adherent. Many cases described as adherent placenta are those of retained placenta instead.

Treatment.—In dealing with cases of retained placenta, the fact that the placenta is not delivered does not make interference necessary. So long as hemorrhage does not occur, the operator may delay an hour if necessary to secure uterine contraction, and to secure relaxation of the lower portion of the womb. The patient must be closely watched during this time and should hemorrhage occur, the placenta must be expressed or manually removed. In attempting the removal of the placenta, thorough antisepsis is demanded. The bladder should be emptied by catheter, the vagina should be thoroughly swabbed with sterile cotton sponges dipped in 1 : 2000 bichloride solution or 1 per cent. lysol, or a copious vaginal douche of 1 per cent. lysol should be given. The hands should be made antiseptic, and the hand which is to remove the placenta should be covered by a sterile glove. When the fingers reach the cervix, it is not unusual for the operator to find the placenta within the cervix and lower uterine segment. In these cases, it is sufficient to grasp it by the thumb and fingers, folding it together and removing it by gentle traction with rotation, twisting the membranes into a cord. Traction should be downward and backward and great gentleness should be employed. In other cases the placenta may be found like a reverse central placenta prævia, the fœtal surface presenting, but the placenta drawn completely across the os. In these cases one edge must be loosened, the placenta folded upon itself and delivered. In cases where the placenta is not detached and it is necessary to remove it, the hand should be passed into the uterus and the back of the hand turned toward the uterine wall. Finding the edge of the placenta, the operator gently inserts the fingers between the wall of the uterus and the placenta by a motion resembling that of a paper knife between the leaves of a book. If this procedure is not practicable, he may grasp the placenta upon its fœtal aspect as one would grasp a sponge, and by the finger tips separate the placenta while compressing it, drawing it downward. This must be done slowly and carefully, when little difficulty will usually be experienced in removing the entire placenta.

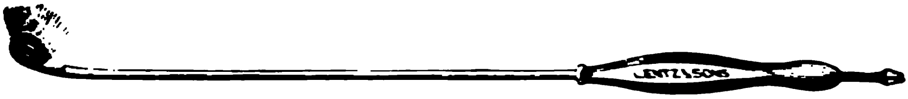
In cases where the placenta is obstinately adherent and cannot be separated after reasonable effort, the uterus should be thoroughly douched with lysol, 1 per cent., and firmly packed with iodoform gauze, 10 per cent. The vagina should be tamponed with dry bichloride gauze. Tonic doses of strychnia and ergot should be given. In from thirty-six to forty-eight hours the placenta will usually separate sufficiently to permit its removal. The gauze should then be removed, the uterus thoroughly irrigated and the placenta removed with the fingers or the blunt obstetric curette. After the removal of the placenta, the uterus should be lightly tamponed with iodoform gauze for twenty-four hours.

The manual removal of the placenta exposes the patient to the danger of infection and injury to the uterus and to the entrance of air into the sinuses of the womb. The operation should always be a bimanual one, the external hand holding the uterus in the position most favorable for the operator and keeping him informed of the amount of force which he is exerting. Under strict antiseptic precautions and with reasonable skill, the placenta may be safely removed. If the operation be undertaken carelessly, without antiseptic precautions, it is one of the most fruitful sources of puerperal hemorrhage and infection.

Manual Removal of the Membranes.—In some cases the membranes are found adherent around the internal os uteri and may be torn off and retained. In these cases, the fingers must be cautiously used to separate and bring away the adherent portions. Difficulty may be experienced in recognizing the membranes with the fingers covered by a rubber glove. Usually, however, it is not difficult to remove them.

Curetting the Puerperal Uterus.—In order to perform this operation successfully the condition of the puerperal uterus must be taken into consideration. The uterine sinuses are closed by thrombi formed at the mouths of the openings left after the separation of the placenta. These serve a double purpose, not only to prevent bleeding, but also to exclude infective material from without. If, however, these thrombi be removed by a curette, there is danger of bleeding, while septic infection, if present in the uterus, gains direct access to the circulation. The uterine decidua is a membrane which is discharged in normal cases by degrees without infection. Beneath this membrane [illegible] tissue, which serves as a barrier against any infective agent which might otherwise pass the cells of the decidua. In completely emptying the uterus it must be remembered that the operator does not desire to penetrate further into the uterine tissues than to remove the decidua. This is best accomplished by a blunt curette, which will not remove the thrombi closing the sinuses, thus opening fresh channels of infection. The obstetric curette should be considerably larger than that employed for the non-puerperal uterus. It may also combine to advantage the function of a douche-tube by having a hollow stem through which an antiseptic fluid may pass, freely irrigating the uterus during the process of curetting.

Fig. 2[illegible]



Obstetric douche-curette.

In selecting an antiseptic fluid for this purpose carbolic acid or one of its derivatives is to be preferred to bichloride of mercury. There is undoubted evidence that bichloride solutions used within the uterus may occasion mercurial poisoning. Carbolic acid, 2 per cent., or lysol, 1 per cent., is most convenient for this purpose.

To empty the uterus thoroughly, if the operation be done at labor, an anæsthetic is often necessary. If the patient has been delivered under anæsthesia, curetting may be done before she awakens thoroughly. If the operation be done during the puerperal state, it is best to avoid the use of an anæsthetic if possible. If it is requisite, however, ether should be chosen.

The operator will require for this operation an obstetric curette with hollow stem to which may be attached the hose of a large fountain syringe or irrigator. Two gallons of 1 per cent. lysol or normal salt solution at a temperature of 105° F. should be in readiness. Antiseptic gauze in a strip 4 inches wide and a yard long should also be at hand, while curved uterine dressing-forceps will be required.

The patient is placed upon her back at the edge of a bed or table, the bladder and rectum emptied, the external parts thoroughly cleansed with bichloride of mercury solution, 1 : 2000, and a copious vaginal douche of creolin, 2 per cent., or lysol is given.

The field of operation is surrounded with sterile linen. Having thoroughly cleansed his hands and instruments, the operator inserts the fingers of the left hand behind the cervix to act as a guide. The other hand should be placed over the fundus of the uterus and the uterus may be gently pressed downward in the axis of the pelvis. The curette is attached to an irrigator and the fluid allowed to flow. The curette is then introduced along the fingers of the guiding hand and gently inserted into the os and cervix. The interior of the uterus is to be thoroughly scraped with the curette, without, however, the exercise of force, while the antiseptic fluid thoroughly irrigates the interior of the womb. As the patient has been placed for this operation upon a rubber sheet or rubber pad, the antiseptic fluid will run over this rubber sheet into a bucket or jar placed beneath the edge of the bed. While the scraping is going on the operator can examine the fluid as it runs out and note the presence or absence of pieces of placenta, membrane, or decidua. When the uterus has been thoroughly but gently scraped with the curette until the fluid comes back clear, the curette may be removed and the uterus tamponed with antiseptic gauze. The end of the gauze should be left protruding from the cervix. The vagina should then be tamponed with bichloride of mercury gauze and an occlusion dressing and a bandage placed over the vulva.

After-Treatment.—The patient should be given strychnia and ergot by hypodermatic injection, and tonic doses of strychnia and ergot should be given by the mouth when the effect of the anæsthetic has passed away. The vaginal dressing should be changed when stained through, while the gauze within the uterus may remain for twenty-four or thirty-six hours. When removed it should be done with thorough antiseptic precautions. The vagina should be douched with bichloride, 1:4000, as soon as the gauze is removed, followed by an intrauterine douche of carbolic acid, creolin, or lysol, 1 per cent., or normal salt solution. In cases where the uterus is large and flabby it is well to give ergot and strychnine until the condition of the womb and patient's general health are greatly improved. It is well to move the bowels on the day following the operation. The after-care of the case is that usually given to normal puerperal patients.

It is rarely necessary to repeat curetting of the uterus, although in septic cases, where the lochia becomes foul, it may be best to curette the uterus a second time within thirty-six hours after a first curetting. If excessive pain be complained of after the operation, it may often be relieved by applying a hot turpentine stupe over the abdomen, or by a prompt emptying of the intestines through high injections.

Dangers of Curetting the Puerperal Uterus.—If septic infection has been present for some time, the wall of the puerperal uterus is much softer than normal and much more easily penetrated. Too much caution cannot be observed in avoiding this accident. It is well to complete the curetting before irrigation, so that should rupture occur, fluid will not enter the peritoneal cavity. If the operation be done bimanually, should the uterus be perforated the operator will usually feel the curette with the external hand, while the hand grasping the curette will appreciate the fact that it has slipped beyond its normal length. In the presence of this accident, if the patient is in a hospital, she should be immediately prepared for abdominal section, the abdomen opened and the uterus inspected. If a large area of softened and septic tissue is found at the fundus of the uterus, hysterectomy followed by drainage is indicated. If the uterine wall is in fair condition it may be closed by fine catgut stitches, the pelvis sponged with normal salt solution and a gauze drain passed to the bottom of the pelvis behind the uterus. This should be brought out at the lower end of the abdominal incision, and removed after forty-eight hours if the patient does well. If severe infection with pelvic peritonitis is present, a gauze bag should be passed into the pelvis behind the uterus and the bag distended with gauze. This will prevent the formation of adhesion between the pelvic and other viscera, and will secure thorough and competent drainage. If the patient is not in a hospital and the uterus is in fair condition and perforation occurs during curetting, the curette should be immediately removed and the uterine cavity carefully wiped out with sterile cotton dipped in sterile salt solution. The cavity should then be packed with iodoform gauze and the vagina with dry bichloride gauze. The bowels should be thoroughly moved by salines and an ice bag placed upon the abdomen. With these precautions patients have recovered from perforation with but very little disturbance.

The dangers and complications of curetting the puerperal septic uterus may be illustrated by the following case in the experience of the writer:

A patient who had been delivered without assistance in a tenement-house was admitted to the Philadelphia Hospital in a septic condition. Two weeks after labor as involution proceeded badly and there was a persistent foul discharge, the patient was curetted under ether with antiseptic precautions. The uterus was found in subinvolution and partially retroverted. During the curetting the instrument was felt at one time to pass further than usual. The anaesthetizer noticed a change in the patient's pulse for a moment while an assistant who compressed the uterus thought he detected an unusual movement beneath his hand. Curetting was immediately suspended, the uterus cleansed and packed with gauze. The patient showed no signs of the accident for forty-eight hours, and as the operation was done very gently it seemed probable that no perforation had occurred or that a very slight injury had been done to the uterus. At the end of forty-eight hours the temperature and pulse rose, and the patient complained of pain in the lower part of the abdomen. She was immediately anaesthetized and the abdomen opened. The uterus was found very adherent to the intestines and pelvic peritonitis present. On attempting to loosen the adhesions so that the fundus of the uterus could be inspected, an opening was made into the intestine, adhesions were broken up and a perforation found at the fundus, where the tissue had sloughed, admitting the tip of the little finger. The bottom of the pelvis contained dark-reddish serum. The pelvic tissues and adherent intestine were injected. The opening into the bowel was closed with fine catgut, and it was decided not to close the opening in the uterus as the borders of the aperture were soft and suture would not hold. As the area was small it was determined to make an effort to save the uterus. Accordingly the pelvis was thoroughly sponged with normal salt solution and a Mickulicz gauze drain carried to the bottom of the pelvic cavity. This was filled with gauze, maintaining the uterus in normal position, draining the pelvis and holding back the intestine. The wall of the intestine gave way where it had been sutured and a fecal fistula occurred. The patient, however, made a complete recovery and left the hospital in excellent condition. The gauze bag was allowed to remain until a firm sinus had formed which drained the intestine and the pelvis as well. This gradually closed under daily irrigation with salt solution and gauze packing. The patient suffered in addition from mammary abscess.

CHAPTER XII.

DRAINAGE AND HYSTERECTOMY FOR PUERPERAL SEPTIC INFECTION.

Drainage.—In treating puerperal septic infection, the general surgical principle that collections of pus should be emptied holds good. Such collections are usually within the pelvis, rarely localized within the abdomen and occasionally within other portions of the body. Thus the pleural cavity may contain pus. Abscesses in the joints may be present, phlegmonous inflammation may result in abscess in the lower extremities and even abscess of the brain may develop as the result of septic embolism. Those cases which fall especially under the care of the obstetrician are cases of pelvic suppuration following puerperal septic infection.

Pelvic Abscess.—The diagnosis of pelvic abscess following puerperal septic infection is made by first recognizing the septic infection present and then localizing a collection of fluid within the pelvic cavity. Distinct fluctuation can rarely be obtained, but a boggy sensation and evident bulging are usually present. In these cases the operator should do more than simply open the pelvic abscess. Efficient measures should be taken to secure good drainage, and this should so be done that adhesion of the tubes and ovaries should be gradually loosened and the parts restored as nearly as possible to their normal condition. A free incision should be made across the posterior *cul de sac*, giving ample room for the insertion of the fingers.

The abscess should be opened and thoroughly sponged out with sterile cotton dipped in salt solution, and a careful examination made to determine the condition of the Fallopian tubes. If fluctuation is detected in addition to abscess, fluctuation should be opened and fluid allowed to escape. Adhesions should be gently loosened and an ample packing of iodoform gauze inserted, raising the uterus and tubes and distending the pelvic cavity. The patient should be given salines freely and have a nutritious diet with tonic doses of strychnia and alcohol. The gauze may be left for from three to five days when it should be removed and a fresh packing inserted. As the cavity grows smaller, irrigation with normal salt solution may be cautiously practised at each changing of the dressing. So soon as the patient's general condition permits, she should be raised from bed to promote complete drainage.

Treatment by Abdominal Section.—Some operators prefer to treat all suppurating conditions in the pelvis by abdominal section. If this method be selected, the operator must be careful to disturb as little as possible adhesions which wall off a pelvic infection from the general peritoneal cavity. If upon opening the abdomen the pelvic focus is found completely separated from the peritoneal cavity, it is wiser not to break down the partition but to close the abdominal wound, and utilizing the knowledge thus obtained to open the pelvic cavity through the vagina. If, however, no distinct separation is found, and if the Fallopian tubes are distended with pus, the operator may proceed to open and drain them or to remove them as his judgment dictates. The pelvis should be sponged carefully with sterile cotton dipped in salt solution and salt solution introduced freely into the abdominal cavity. If drainage is employed, it should be made by opening the vagina, and if the pus is probably sterile, the abdomen may be closed without drainage.

Opening of Abscesses in Other Portions of the Body.—Whenever practicable, septic collections occurring during the puerperal condition must be opened and drained. Abscess in the abdominal wall, collections of pus in the joints, phlegmonous collections and abscess in any portion of the body accessible to exploration must be promptly emptied. The principles of general surgery govern in these cases, it being important that free evacuation be obtained and that the foci be disinfected with peroxide of hydrogen; packing with iodoform gauze or in large collections the use of the drainage tube is indicated.

HYSTERECTOMY.—When the puerperal uterus contains a fibroid and becomes infected or when the placenta is adherent and cannot be removed and the uterus becomes infected, hysterectomy is indicated. It is safest in these cases to remove the entire uterus, inserting gauze in the pelvic cavity for drainage. If the puerperal uterus is the site of cancer, it may be considered in a practically septic condition and should be entirely removed. In cases where a patient is septic in labor, the child being dead, the uterus should be removed if possible unopened to avoid increased danger of contamination of the peritoneal cavity.

Hysterectomy for puerperal septic infection without the complications which we have described has occasioned wide discussion. Some have enthusiastically urged it, all obstetricians of experience have tried it. In the present state of our knowledge in desperate cases hysterectomy does no good. In cases which are not desperate, the operator can never feel sure that the patient might not have recovered without the sacrifice of the uterus. In many cases dying after hysterectomy, a complete autopsy shows widespread infection with undetected foci in other portions of the body.

Partial hysterectomy for puerperal septic infection has also been advocated. By this procedure the operator excises those portions of the uterine wall which are especially soft and which give evidence of local infection. This procedure is of too recent date to enable us to form a definite conclusion regarding its value.

In our own experience, the Porro operation has been useful in some cases of puerperal septic infection. These may be divided into two classes, in one of which the patient was in labor and septic with the child dead, and in the other the puerperal uterus had been thoroughly emptied, the patient had received constitutional treatment but failed to improve. In the second class of cases, however, the operation was done within forty-eight hours of the first recognition of a severe puerperal infection. Experience shows that this was too soon to positively determine the degree of virulence present in a given infective process.

If the operator decides upon hysterectomy, that form of operation should be chosen which exposes the patient to least shock and which enables the operator most thoroughly to inspect the pelvic tissue. Vaginal hysterectomy might seem the operation of choice were it not for the fact that the examination of the pelvic contents is less thorough by this method than when abdominal section is performed. Care should be taken to disturb adjacent tissue as little as possible in performing hysterectomy, and the total removal of the uterus should if possible be the method of operation selected.

In hysterectomy for puerperal septic infection, the Fallopian tubes should be removed with the uterus. They are infected also and can serve no useful purpose if allowed to remain. If the ovaries seem uninfected, one or both of them should be left to spare the patient the disturbance of a premature menopause.

CHAPTER XIII.

THE REPAIR OF LACERATIONS OF THE CERVIX CAUSED BY LABOR.

Immediate Repair.—When laceration of the cervix occurring a labor is accompanied by hemorrhage from the vessels of the cervix immediate closure with the checking of this hemorrhage is indicated The diagnosis of cervical hemorrhage is made when the body of th womb is well contracted and blood persistently oozes or trickles fro the vagina. When upon examination no laceration in the vagin adequate to cause such bleeding is found, a diagnosis of cervical hemorrhage is clearly indicated.

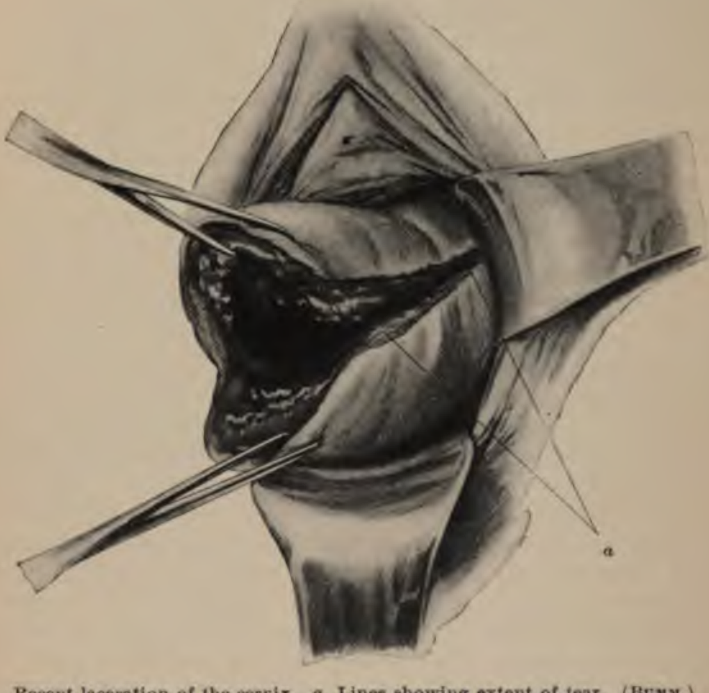
To repair this injury the patient should be placed upon her bac or upon the side at the edge of a table, the bladder should be emptied by catheter and the pelvic floor drawn downward and backward by a speculum. Both lips of the cervix should be grasped in the middle by a strong tenaculum forceps and the cervix drawn downward and thoroughly examined by the finger and by inspection. Usually the tear is greatest upon the left side. When the parts have been thoroughly cleansed by antiseptic solutions, the cervix should be drawn to the opposite side from that in which the sutures are to be placed. This exposes the lacerated surface to inspection, and usually enables the operator to guide his stitches by the eye as well as by the finger. A fully-curved needle threaded with medium-sized chromicized catgut should then be passed through the highest point of the tear, bringing the tissues into accurate apposition. Care should be taken to have the stitch include the whole of the torn tissue. Other stitches may be placed as the length of the tear demands, but care should be taken not to close the lower portion of the cervix too tightly. If the tear is bilateral, the cervix should then be carried to the opposite side, and the other side of the cervix repaired as before. In stellate lacerations, the worst only demand suture and these may be selected after examining the cervix in the manner described.

Closure of the cervix is often done in cases in which the uterus has been tamponed with iodoform gauze to check or to prevent hemorrhage. The closure of the cervix should not interfere in any way with the removal of the gauze. Vaginal douches are not indicated in these cases, for if strict external antisepsis be maintained, stitches in the cervix seldom become infected. As catgut is used stitches need not be [illegible] the knots will come away in about two weeks after [illegible]

This operation immediately checks hemorrhage and is followed by [illegible] in a considerable number of cases. In some, union does not [illegible] the reason of its failure is not apparent. In others only the upper portion of the tissue brought together unites. It is especially important that the highest stitch includes the upper limit of the laceration and that the tissues be brought together smoothly and solidly. Some prefer for this purpose the use of continuous catgut suture.

Secondary Repair.—Observation shows that a patient may sustain a considerable laceration of the cervix which does not heal and that good general health may continue. It is believed by many that malignant disease in the cervix is more apt to occur after laceration than in patients in whom the accident has not happened. Aside from malignant disease, the effect of a tear in the cervix upon the general health of the patient depends not only upon this lesion but upon the presence or absence of infection, degenerative processes in the glands of the cervix, and prolapse of the mucous membrane of the cervix and vaginal wall.

FIG. 236.



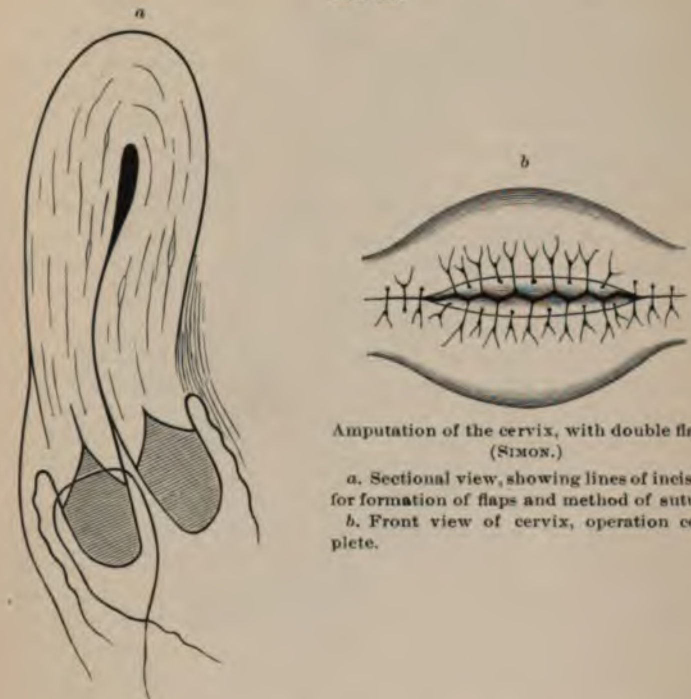
Recent laceration of the cervix. *a*. Lines showing extent of tear. (BUMM.)

In deciding whether a given case requires the operation of trachelorrhaphy a physician must examine not only the cervix, but the body of the womb, and carefully study the peculiarities of each individual patient. If the uterus be found but little enlarged, if the lips of the cervix are not hypertrophied, if the mucous membrane is not chronically inflamed and covered with patches of granular degeneration, and if the glands in the cervix are not enlarged, the presence of a tear is not a valid indication for closure by operative means. In some of these cases, if the cervix be palpated, a sensitive spot may be found in the torn tissues, which the patient distinctly appreciates upon pressure and which is thought to be caused by an enlargement of a nerve-filament in the tissues. Patients are sometimes benefited by excising this point and closing the tissues by stitches. If, however, no such point be found, with the absence of the conditions just described, there is certainly no good indication for sewing up the cervix. Observation shows that it is possible for a patient to have a cervix very considerably torn and still to be in excellent general health. Her ill-health must, in cases where suffering follows laceration, be due to some other cause than a simple tear of the tissue.

In cases where examination reveals the fact that the uterus is enlarged, that the lips of the cervix are considerably hypertrophied, that the glands are chronically enlarged, and that the mucous membrane has become eroded, there can be no question of the necessity for operative treatment.

Curetting and Trachelorrhaphy with Resection of the Cervix.—This, however, should comprise more than a simple closure of the lips of the cervix by suture. The cavity of the uterus should be thoroughly curetted under careful antiseptic precautions; the uterus should be douched and packed with gauze. The enlarged lips of the cervix, containing degenerated glands, should be resected and not simply freshened and brought together. When the diseased tissues in the cervix are removed the effect upon the condition of subinvolution is very considerable, and often brings about a relief from this condition. To perform this operation, namely, of resection of the cervix, the physician will require retractors and specula, using Sims' speculum or those suitable for vaginal hysterectomy. He will also need a small scalpel, tenaculum forceps, fully-curved needles of small and medium size, scissors curved upon the flat, needle-holder, uterine dressing forceps, uterine dilators, silk or catgut for suture, and a uterine curette, preferably of the sort known as douche-curette. The patient should be prepared for operation by thoroughly emptying the intestine, by emptying the bladder, and by disinfecting the vagina and the cervical canal. This is best performed by douching the vagina with a mixture consisting of creolin or lysol and green soap, equal parts. Of this a 2 per cent. solution is employed. The cervix is to be exposed by a speculum and the cervical canal thoroughly scrubbed with cotton soaked in the solution mentioned, in the grasp of the dressing forceps. The external parts are to be scrubbed with soap and water, rinsed with hot water, and then scrubbed with bichloride solution, 1 : 2,000. The patient is anæsthetized with ether, placed upon her back at the edge of a bed or table, and the field of operation surrounded by sterile linen. In addition to the instruments of the operator there should be at hand antiseptic gauze, bichloride solution, 1 : 2,000; carbolic solution or creolin, 2 per cent., with stimulants and hypodermatic syringe in good working order. The operator, having cleansed his hands surgically and covered himself with an antiseptic apron or gown, sits before his patient, her hips being brought to the edge of the bed or table, and her thighs supported by assistants or by some form of leg-holder. The vagina should be thoroughly douched with bichloride solution, 1:2,000, the cervix exposed by retractors and grasped by the tenaculum forceps inserted into the posterior lip. Dilatation is then performed by using graduated bougies until a curette can be introduced without difficulty. The curette should then be attached to a fountain syringe and the interior of the uterus thoroughly scraped, while a carbolic solution, 2 per cent.; creolin or lysol, 2 per cent.; normal saline solution, thymol, 1:1,000, or dilute iodine, should run through the curette, freely flushing the uterus. The fluid will run out from the vagina and should pass over the rubber pad, on which the patient rests, into a bucket beneath the edge of the table. When the fluid returns from the uterus perfectly clear, the womb should be tamponed with a strip of antiseptic gauze three inches wide and a yard long. But a portion of this gauze can be used within the uterus, the rest being employed to tampon the vagina if necessary. The gauze employed within the uterus must be cut so short that its end will not project to any distance through the cervix.

FIG. 237.



Amputation of the cervix, with double flaps. (SIMON.)

a. Sectional view, showing lines of incision for formation of flaps and method of suture.
b. Front view of cervix, operation complete.

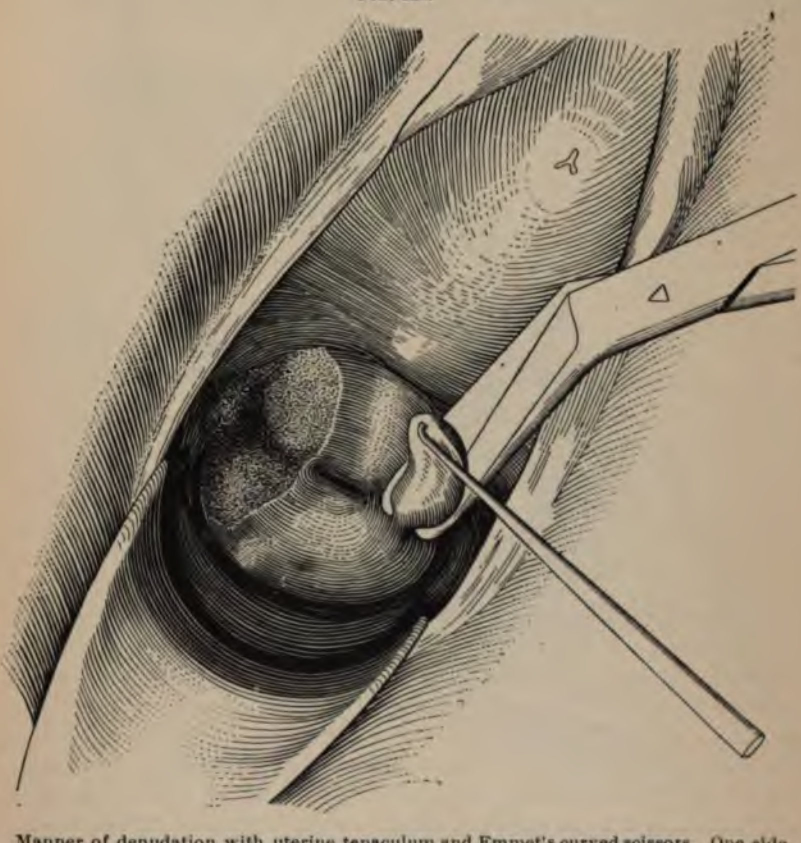
The operator should next proceed to resect the diseased tissue in the lips of the cervix. The intrauterine tampon of gauze should be pushed up out of the way, and the anterior lip of the cervix seized by tenaculum forceps. Some prefer to pass a suture through it with which to hold the cervix during the operation. The operator next cuts asunder the lips of the cervix on each side of the incision, extending almost to the junction of the vagina. With a small, sharp scalpel or with scissors, the operator then outlines the incision in the anterior lip of the uterus along the edge of the peritoneal covering and along the mucous membrane of the cervix as far internally as the size of the cervix permits. These incisions meet at the sides of the uterus. The operator then incises the lip of the cervix selected, allowing his knife or scissors to pass upward and toward the central line, so that the two incisions meet, the part excised having the shape of a wedge, of which the broad surface is external and the narrow internal. In this manner a wedge is excised from the lip and two flaps are left of tissue, which may be brought together with sutures. The material selected for this purpose may be catgut, if any which is positively known to be reliable may be procured, and in default of this medium-sized silk, rendered sterile by boiling, should be used. The first suture is passed in the middle of the cervix. Others are inserted upon either side, and the two flaps are brought in apposition. The same operation is then done on the posterior lip, and when each lip of the cervix has been properly closed, stitches may be inserted on each side through both lips of the cervix, if such be required. The end of the intrauterine gauze tampon should then be pulled out from the uterus, so that it protrudes for an inch from the cervix. The vagina should be thoroughly douched with bichloride, 1 : 2,000, and lightly tamponed with antiseptic gauze. An occlusion-dressing should be placed over the vulva, which is kept in position by a T-bandage.

Trachelorrhaphy (Emmet's Operation).—Where the cervix is not extensively thickened and its mucous membrane degenerated, it may be sufficient to excise scar tissue and to bring together freshened surfaces. In doing this a portion of membrane must be left upon each lip of the cervix in the centre to form the lining for a new cervical canal. This strip of membrane in the centre should be trumpet-shaped, the larger portion externally, so that when closed the cervix will flare outward at its external extremity. Especial care must be taken in freshening the edges that scar tissue in the angle of the laceration should be removed. This dissection is best accomplished by Emmet's scissors, unless the physician strongly prefers and is accustomed to the use of a scalpel. The operator should fit the lips of the cervix together by tenaculum forceps, thus recognizing the extent of the laceration. When the surfaces have been denuded, stitches should be inserted with a sharp or bayonet-pointed needle, curved at the point, as the tissue is ordinarily difficult to penetrate. Chromicized catgut of good size may be used. Care should be taken that the stitches include the entire tissue which is brought together.

It is best to precede this operation by a thorough curetting, including thorough scraping of the mucous membrane of the cervix with a small sharp curette.

After-Treatment.—These operations should not occasion severe pain after the patient recovers from the anæsthetic. Irritation about the bladder is sometimes observed, partly owing to the pressure of the tampon and also to the fact that in some cases the traction made upon the uterus during the operation pulls upon the bladder and makes the tissue sensitive. This, however, soon passes off. The patient may lie upon her side as soon as she pleases, and usually requires no anodyne after the operation. If necessary, she should be catheterized every eight hours, and the vulva and meatus should be thoroughly cleansed with bichloride, 1 : 2,000, after each micturition and after defecation. Twelve hours after the operation the gauze in the vagina should be removed, the vagina cleansed by sponging with bichloride, 1 : 4,000,

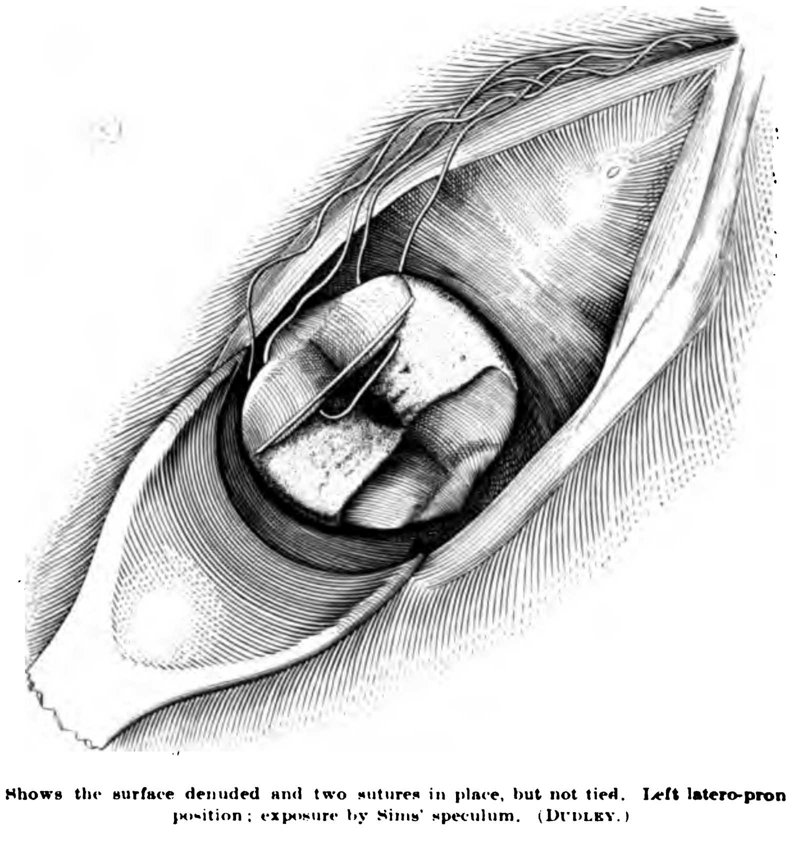
FIG. 238.



Manner of denudation with uterine tenaculum and Emmet's curved scissors. One side denuded, the other partly denuded. Left latero-prone position; exposure by Sims' speculum. (DUDLEY.)

and again lightly tamponed with antiseptic gauze. In twenty-four to thirty-six hours after the operation the vaginal and uterine gauze should both be taken out and the vagina douched with lysol, 1 per cent., or bichloride of mercury, 1 : 8,000. The patient should then empty her bladder spontaneously and the bowels should be freely moved. A douche night and morning of bichloride, 1 : 8,000, or of normal saline solution, should be given. The patient's diet may be easily digested food, care being taken that the bowels move daily. If silk has been used for suture material, it should be removed two weeks after the operation. If catgut is used, it will not require removal. If the patient does well, she will have recovered from the operation in between three and four weeks, and after her next menstrual period has been completed she may go about her usual avocations. The result of this operation is to lessen very greatly the size of the womb, to cure the discharge from the cervix, and thus to stop many of the annoying symptoms from which the patient has suffered.

FIG. 239.



Shows the surface denuded and two sutures in place, but not tied. Left latero-prone position; exposure by Sims' speculum. (DUDLEY.)

Results of Curetting and Repair of the Cervix.—In most cases the results of curetting and repair of the cervix are satisfactory. The uterus diminishes considerably in size, annoying discharges cease, chronic infection of the endometrium disappears, pains and neuralgic sensations about the pelvis and in various parts of the body are no longer present and the general health is greatly improved. Should pregnancy not take place until two years have elapsed after operation there will be no increased danger of a repeated laceration at labor. Should pregnancy, however, immediately follow recovery from the operation increased danger of fresh injury will be present at parturition.

CHAPTER XIV.

THE REPAIR OF INJURY TO THE PELVIC FLOOR AND PERINEUM CAUSED BY LABOR.

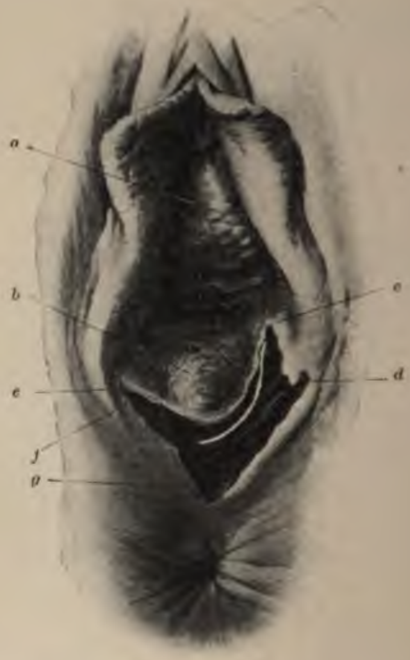
Immediate Repair of Incomplete Lacerations.—Very few labors occur without some laceration of the tissues at the entrance to the vagina. This may be the tearing of the mucous membrane at the fourchette only, or it may extend into the deeper tissue. So far as the patient's health is concerned, tears extending through mucous membrane only require no suture, as the structure which is injured is not essential to the health of the patient. When, however, a tear occurs further than this tissue, even though it may seem slight at the time, it should be immediately closed. By bringing together torn surfaces, there is less danger of septic absorption and by keeping the tissue of this region sound and firm in subsequent labors a greater and more important tear will be prevented.

Lacerations requiring suture extend into one or both of the sulci of the vagina and also into the perineal body. The former do not open cutaneous tissue, the latter tear the skin toward the rectum. Of the two the more important are tears of the sulci, as they loosen the fascia attached to the rami of the pubes and sides of the pelvis and thus predispose to sagging and protruding of the pelvic floor. Tears of the sulci are not apparent until the pelvic floor is raised or until the vulva is widely opened. To ascertain whether lacerations have occurred the patient should be placed upon the back at the edge of a bed or table. With the patient's thighs separated, the operator should insert the longest finger of one hand into the bowel, raising the pelvic floor and separating the labia. He will thus be able to recognize the existence of lacerations extending into the sulci and along the pelvic floor.

The repair of these injuries requires the bringing together of tissue which has been torn. This cannot be accomplished by passing sutures through the skin tear, excluding the sulci. Complete closure requires that both lines of laceration should be brought together. If one were to be neglected the tear in the central line might be left with least damage to the patient.

Tears in the sulci and fascia should be closed with chromicized catgut of medium size passed deeply beneath the tissues with a fully-curved needle. The interrupted suture is better than continuous suture, although in very long lacerations some prefer the continuous stitch. Thorough antisepsis should be observed and anæsthesia may be employed if the patient is highly excitable and sensitive. Usually it is unnecessary to employ anæsthesia as the tissues in the sulci are not sensitive and the laceration in the skin has been so recently bruised by the passage of the child that the skin is not as sensitive as ordinarily it is. If the tissues are greatly swollen and edematous, and if the mother is exhausted, the operator may postpone the closure of the laceration for twenty-four hours. If it is impossible to obtain a good light at night, the operation may be safely deferred until a good light can be procured and the circumstances are favorable.

FIG. 240

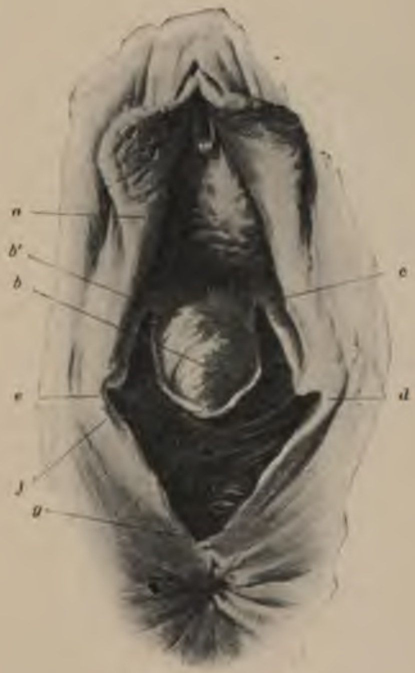


Incomplete recent laceration, greatest in left sulcus. (BUMM.)

a. Anterior vaginal wall.
b. Posterior vaginal wall.
c. Highest point tear, left sulcus.
d. Lowest point tear, left sulcus.
e, f. Tear, right sulcus.
g. Lowest point, perineal tear.

Especial care must be taken to pass the highest stitch deeply and accurately through the tears in the sulci. Each stitch should be tied so soon as inserted and may be left long, and if assistants are present, the tied stitch may be held and gentle traction made, thus raising the floor of the pelvis as the operator proceeds. When the stitches reach the junction of the mucous membrane with the skin, the operator should begin at the lowest point in the cutaneous laceration nearest the bowel and bring the tissues together with silkworm gut, passing the needle deeply beneath the tissues and including all portions of the lacerated surfaces, thus sewing from below upward, the lines of suture in the sulci and the lines of stitches in the skin perineum coming together at the posterior wall of the vagina. It is usually necessary to insert one or two catgut stitches to complete the closure and the fitting together of the tissues. The ends of the catgut stitches should then be cut short and the silkworm gut stitches should be brought together and the ends tied into a knot.

FIG. 241.

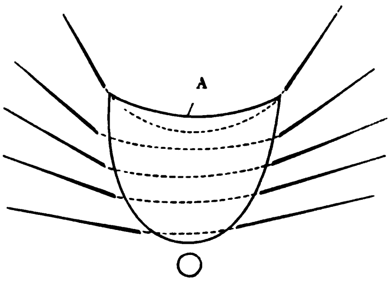


Incomplete recent bilateral laceration (both sulci). (BUMM.)

a. Anterior vaginal wall.
b. Posterior vaginal wall.
b'. Highest point tear, right sulcus.
e, *f*. Lowest point tear, right sulcus.
c, *d*. Tear, left sulcus.
g. Central tear, perineum.

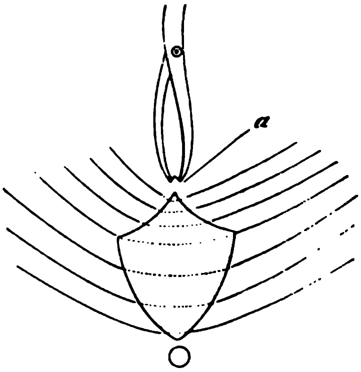
During the insertion of the stitches, irrigation with salt solution may be employed if practicable, and if this is not convenient repeated irrigation and sponging with 1 per cent. lysol with sponges of sterile cotton may be employed. Before each stitch is tied, the stitches should be flushed to prevent the retention of a clot. After the closure is complete, the vagina should be thoroughly douched with lysol, 1 per cent., and a sterile vulvar bichloride dressing should be applied.

FIG. 242.



Torn surface and sutures in incomplete tear of perineum. (DÜHRSSEN.) A. Vagina

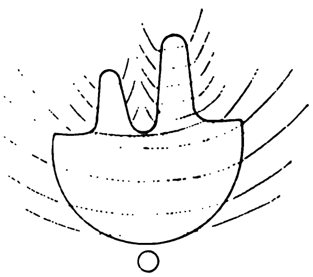
FIG. 243.



Forceps on highest point of incomplete tear. (DÜHRSSEN.) a. Sutures passed.

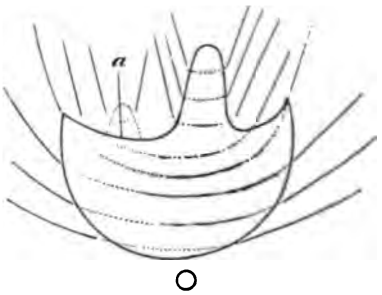
Immediate Repair of Complete Lacerations.—When the tear extends through the perineum opening the bowel, it is said to be complete. In repairing such an injury, the first step in the operation consists in closing the rectum separately, thus converting the complete laceration into an incomplete laceration. For this purpose, medium-size chromicized catgut should be employed, beginning at the highest point of the tear and by continuous or closely-placed suture, bringing the edges of the torn bowel into accurate apposition. Some urge that the knots of this suture be left within the cavity of the bowel. We believe it to be better to gather up the tissue from above, so passing

FIG. 244.



Perineal tear with torn sulci of pelvic floor. (DÜHRSSEN.)

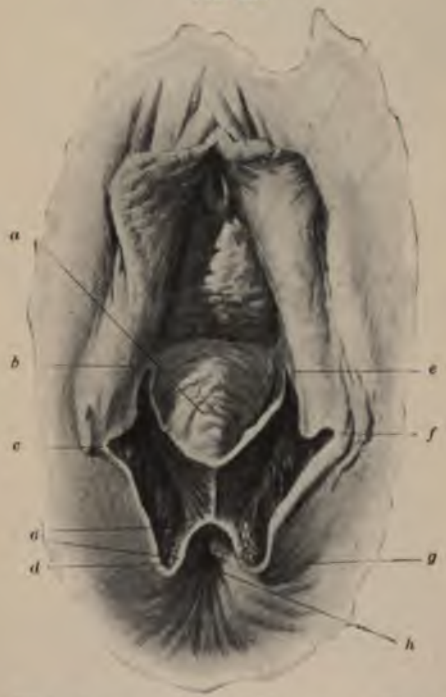
FIG. 245.



Perineal tear with deep tear of sulcus. (DÜHRSSEN.) a. Vagina.

the stitches that the suture material shall not be left exposed within the intestine. When the stitches approach the sphincter, one or two additional buried stitches should be placed in the sphincter muscle; the torn ends of the sphincter should be brought together as accurately and carefully as possible. After the bowel has been closed, tears in the sulci should next be brought together in the manner already described. When this has been accomplished the remaining surface will be a deep central tear of the perineum. If the tissues are redundant and the laceration deep, the parts may be brought together at the deeper portions by several buried stitches of catgut. Usually, however, it is possible to completely close the remaining laceration by passing stitches of silkworm gut through the skin, beginning nearest the bowel and including all torn surfaces. The operation is thus concluded in the usual manner. In cases of complete laceration, it is well to thoroughly irrigate the intestine with lysol, 1 per cent., or normal salt solution before closing the laceration, and also after the stitches have been inserted.

FIG. 246.

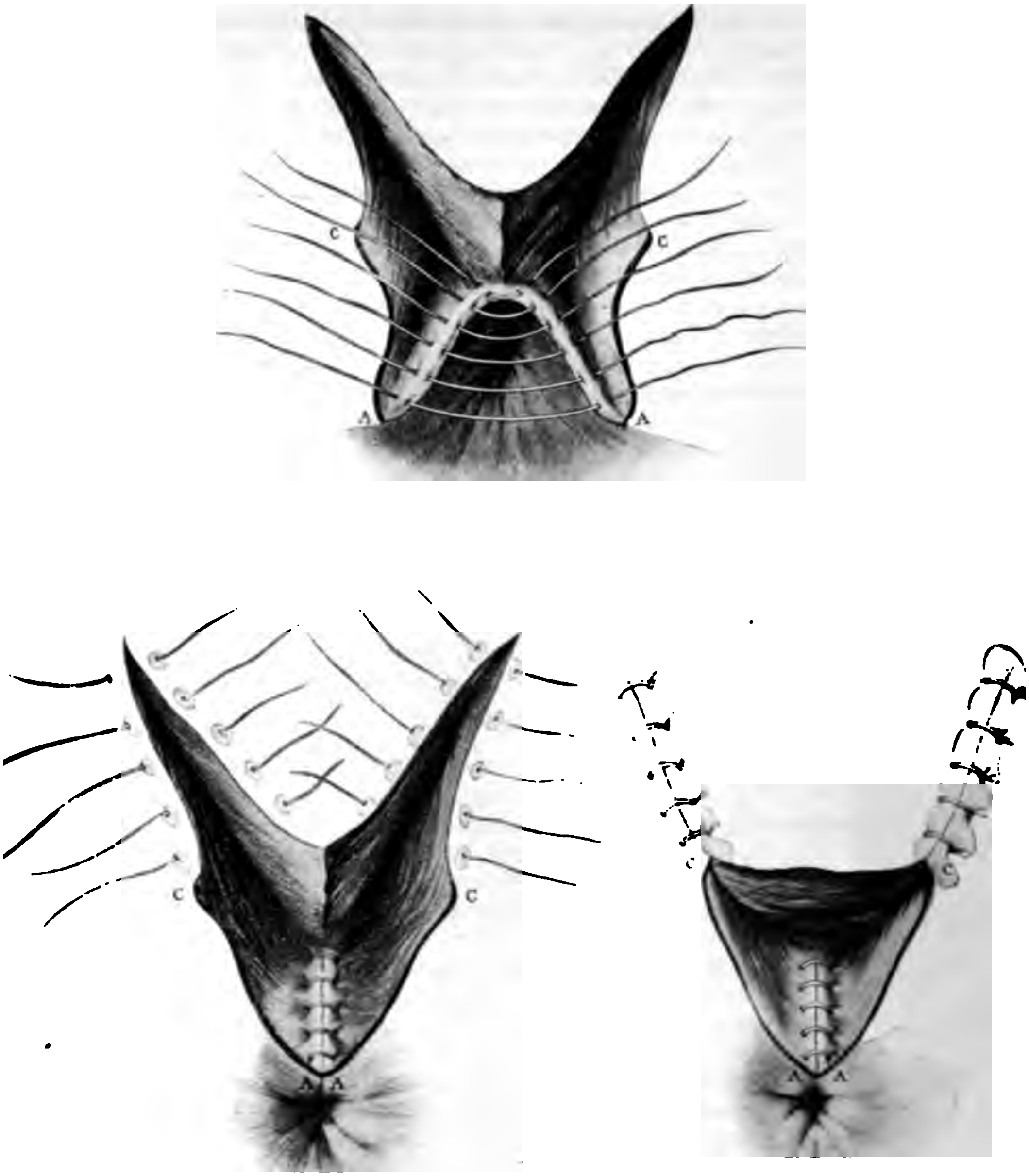


Bilateral tear opening into the rectum. (BUMM.)

a. Posterior vaginal wall.
b c. Tear in right sulcus.
d. Perineal tear and margin of bowel.
e. Tear in left sulcus.
f. Tear in left sulcus.
g. Torn perineum, sphincter and bowel.
h. Anus.

After-Treatment.—In cases of incomplete laceration the patient's

FIG. 248.



Method of suture in bilateral tear opening the bowel. (BUMM.)
A A. Lowest points of tear in the rectal wall.
C C. Highest points of perineal tear and lower end of tears in sulci.

result of the operation. To prevent this, as soon as the patient commences to suffer, she should be given a hypodermatic injection of morphia or a suppository containing 1 grain of the aqueous extract of opium should be placed within the bowel. The operator must use his judgment as to the wisdom of repeating the operation immediately. It was formerly the custom to bind the patient's limbs together after operation for complete laceration of the perineum. With the exception of cases where great pain and violent straining develop, it is unnecessary, however, to do this, although it is well to restrain the limbs by a pad and bandage until the patient is completely out of the anæsthetic.

If the antiseptic precautions described are faithfully followed, infection in the stitches is rare. The thorough preparation of the patient has much to do with the success of the operation. Each patient should be prepared by thoroughly emptying the lower bowel, and in cases where laceration occurs the tissues should be thoroughly cleansed by 1 per cent. lysol before the stitches are taken.

Occasionally catgut knots are retained for some weeks after the operation and a stitch is occasionally seen which does not soften and which requires removal. Buried catgut stitches near the intestine may occasion some irritation and slight pain when the bowels move, but under good care and if a good quality of catgut has been employed, no serious trouble will follow.

Fistula occasionally develops at one point where a stitch may have prematurely separated and left a slight communication between the bowel and the vagina. If the parts are kept thoroughly clean after each bowel movement, such fistula will close spontaneously.

The Immediate Repair of Injuries to the Anterior Segment.—Lacerations of the anterior segment of the pelvic floor are not infrequent. They are usually detected as fissures or tears extending obliquely upward and outward at the sides of the urethra, corresponding relatively to the tears in the sulci of the posterior pelvic floor. If these injuries are deep, free bleeding results, as the veins and small arteries in this region are especially abundant. The detection of these injuries is accomplished by placing the patient upon her back in a good light and separating the vulvar tissue and sponging away accumulated blood.

Such lacerations require immediate closure whether hemorrhage be present or not. Medium-sized chromicized catgut should be passed by a fully-curved needle beneath the lacerated surfaces, bringing them accurately into apposition. Under antiseptic precautions healing readily occurs, as the tissues are out of the way of the lochial discharge and should not become infected. In some cases obstinate bleeding from small vessels occurs and spurting vessels require ligation with fine catgut.

Secondary Repair.—It is interesting to know that, if the supports of the uterus be in good condition, a patient may have a very considerable tear of the perineum in the central line without any resulting disability. Cases are seen in which the perineum has been torn to the rectum, in which the tear did not occur until the outlet of the vagina was reached and in which the supports of the uterus and pelvic fascia were not seriously injured. Many of these cases are seen in strong workingwomen whose muscles are well developed and who suffer no ill results from this condition. On the contrary, in feeble women the slightest injury to the pelvic floor and perineum will be followed by considerable prolapse of the walls of the vagina and even by cystocele and rectocele.

Palliative Treatment.—The palliative treatment of torn perineum and pelvic floor is exceedingly unsatisfactory. Where a patient cannot be operated upon the accompanying vaginal catarrh may be somewhat improved by douches, while it is sometimes possible to fit a large ring-pessary or a retroversion pessary in such a way as to assist in supporting the uterus. The condition, however, is most unsatisfactory, and a physician should never consent to his patient remaining in such a state unless operation is positively refused.

Preparation.—To secure a good result from such operations the general condition of the patient must be good. If chronic indigestion and anæmia be present, they must be in a large part removed before operative treatment can be entirely successful. Where chronic vaginitis is present the mucous membrane should be cleansed and made aseptic by douches of tincture of green soap and creolin, one teaspoonful of each to the quart of water, taken once or twice daily. The bowels should be kept open to relieve engorgement of the blood-vessels about the pelvis. When the patient's general condition is proper a time should be chosen as soon after menstruation as possible. If the patient is nursing a child, the child should be weaned or at least partially fed. The preparation of the patient will depend somewhat on whether the tear is complete or incomplete.

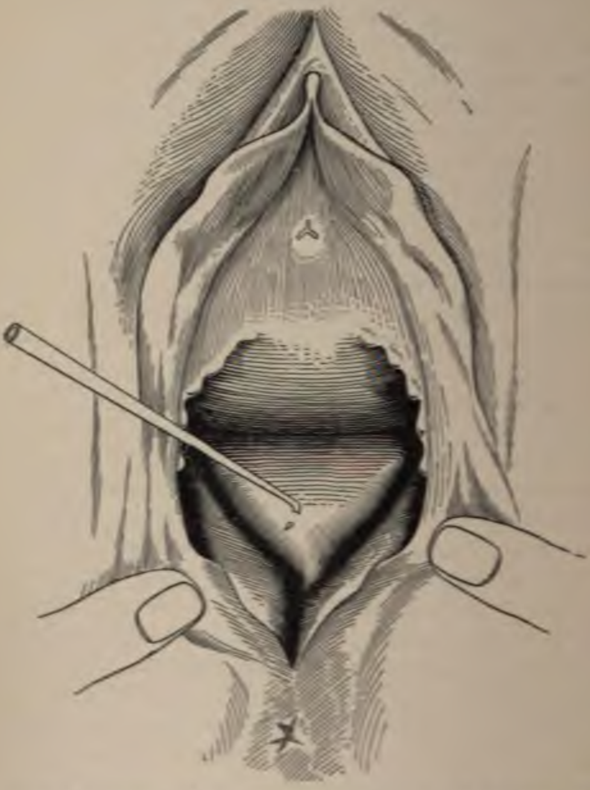
The incomplete tear is much the more frequent, and hence will be considered first. In preparing a patient for an operation for its relief the bowels should be thoroughly emptied. On the second evening before the operation a compound cathartic pill or one grain of calomel with soda should be taken at bedtime. On the following morning a bottle of citrate of magnesia or a half ounce of salts will be required. Unless the bowels move freely, a rectal injection of magnesium sulphate, one ounce; glycerine, one ounce; spirits of turpentine, two teaspoonfuls; and soapsuds, one quart, should be administered. The patient's food should be limited to broth and soup with a little bread and fruit. On the day of operation the patient's rectum should be thoroughly emptied by an injection of castor oil, one ounce, and soapsuds, one quart. The vulva and vagina should be thoroughly scrubbed with soap and water, rinsed, and again cleansed with bichloride solution, 1 : 2,000. The patient should be catheterized, anæsthetized with ether, and the field of operation surrounded by sterile linen. The operator will require for this procedure four pairs of light tenaculum forceps especially adapted to holding flaps of mucous membrane. He will also need a small scalpel, long-handled scissors curved upon the flat, several pairs of hæmostatic forceps, a needle-holder, and curved needles. These may be round or Hagedorn needles. For suture material, silk or catgut and silkworm gut will be needed. A T-bandage and occlusion dressing of bichloride gauze should be in readiness. An abundance of solution of bichloride of mercury, 1 : 5,000, lysol, 1 per cent., or normal salt solution and a fountain syringe will be required. A competent assistant is needed to give ether, and a leg-holder must be supplied unless sufficient assistants will be present to hold the legs. A rubber pad suitable for such operations or a piece of rubber sheeting will be required.

Flap Operation.—In deciding upon an operation for this condition the physician will do well to follow no one method of procedure, but to have several in mind, choosing each according to the needs of the case. The simplest operation for a tear at the outlet of the vagina is that which is known as the flap operation, ascribed to various writers and operators. It consists in putting the parts upon the stretch by applying the fingers or thumbs of assistants below and external to the lowest point in the vagina, making an incision with scalpel or scissors across the septum between the vagina and rectum transversely, and dissecting up the prolapsed mucous membrane in the posterior vaginal wall, and at the termination of this transverse dissection making four cuts, two parallel with the lateral margins of the vagina and two extending downward and outward toward the ischio-rectal fossæ. The result of this incision is to create a freshened surface resembling a parallelogram, and to bring upward and backward the prolapsed mucous membrane of the posterior vaginal wall, which by reason of laceration had prolapsed downward and forward. The sides of this freshened surface are brought together laterally by interrupted sutures of silkworm gut, the needle entering through the skin on each side, emerging in the centre of the freshened surface, re-entering and again emerging through the skin of the opposite side. When the two lateral edges are brought together a few stitches are added above and below to bring together surfaces which need suture. If a small vessel is opened in the dissection, it is twisted or tied. The stitches are removed in from ten days to two weeks after the operation. The patient's bowels are moved on the second day after the operation, and the parts are kept clean by spraying them with boric-acid solution, normal saline solution, or bichloride, 1 : 8,000, powdering them with boric acid and iodoform. It is not necessary to use the catheter, but the parts should be thoroughly cleansed after each micturition. An occlusion dressing of antiseptic gauze should be kept over the vulva. The patient's limbs need not be tied, and she may turn in any direction desired.

This operation does nothing to restore the supports of the uterus and has little if any value in lacerations of the pelvic floor. It restores the skin-perineum and pushes upward and backward the prolapsed mucous membrane of the posterior and lower wall of the vagina. It is not a difficult procedure, but will disappoint the practitioner if it is performed for a laceration of the pelvic floor extending into the lateral sulci and resulting in the formation of a considerable rectocele.

Emmet's Operation.—To estimate rightly the condition of a patient who has sustained a tear of the pelvic floor she should lie upon her back and the parts should be exposed. The patient should then be told to strain or bear down, when there will occur a protrusion of the posterior vaginal wall and behind it the anterior rectal wall, constituting a rectocele. If the labia be separated and the tissues be closely examined, the upper portion of the rectocele or the highest point of the original tear can usually be recognized. It is well to select that point in the centre of the posterior vaginal wall at which the beginning of the tear occurs. The physician should then inspect the two lateral sulci, when he will find that the tear extended up upon one or

FIG. 250.



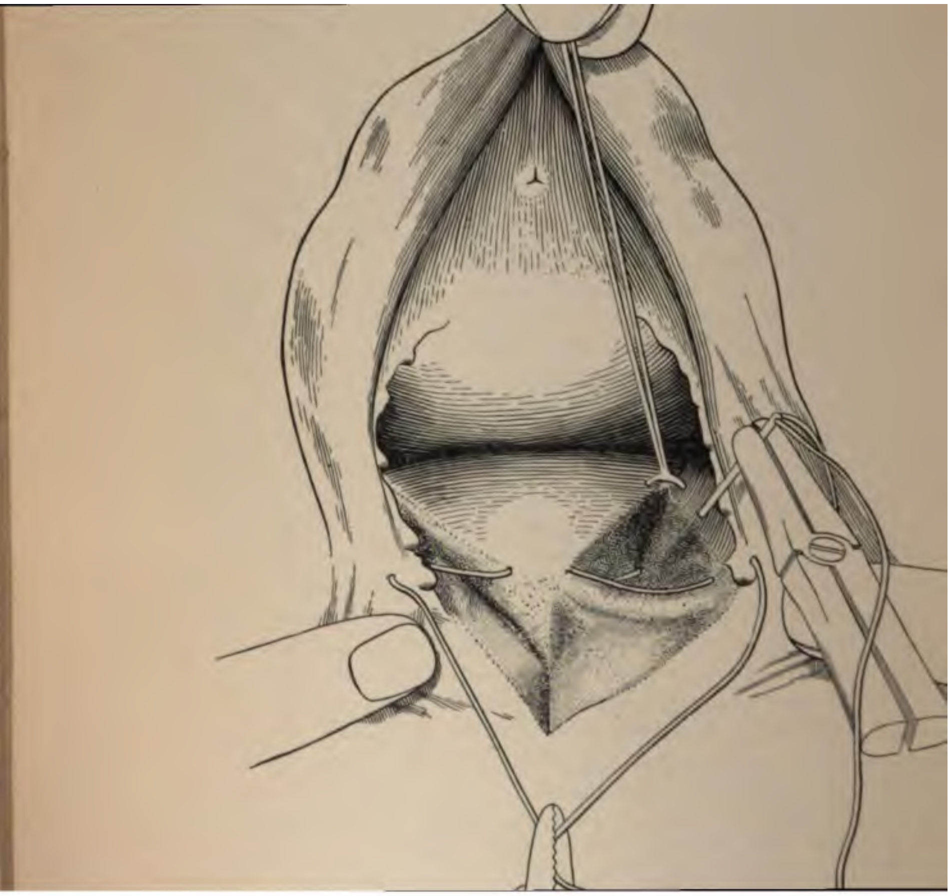
Typical incomplete laceration of the perineum; the tenaculum hooked into the crest of the rectocele (point *b*, of the diagrams) draws it slightly forward and to the patient's right. The lacerations extend far into the two lateral sulci, and from there outward over the fourchette toward the anus. (DUDLEY.)

both sides of the vagina. The extent of the lateral tear should then be observed and also the condition of the sphincter muscle of the bowel. When these points have been made out, the method of operation to restore the parts may be intelligently determined.

No method of repairing such an injury can be successful which does not aim at a twofold result: First, the restoration of the torn fascia at the sides of the vagina; and, second, the restoration of a perineal body between the vagina and the rectum. To accomplish these steps successfully the hypertrophied and cicatricial mucous membrane must be dissected off over an area marking the extent of the original laceration. The sound tissues at the sides of this area must then be united in such a manner as to bring together two distinct lines of suture; the one entirely within the vagina, restoring one or both lateral sulci and running in a direction nearly parallel to the surface of the bed upon which the patient lies upon her back, and the other line of suture extending perpendicularly to the floor or table and joining the first, whose function it is to bring together the denuded surfaces of the restored perineal body.

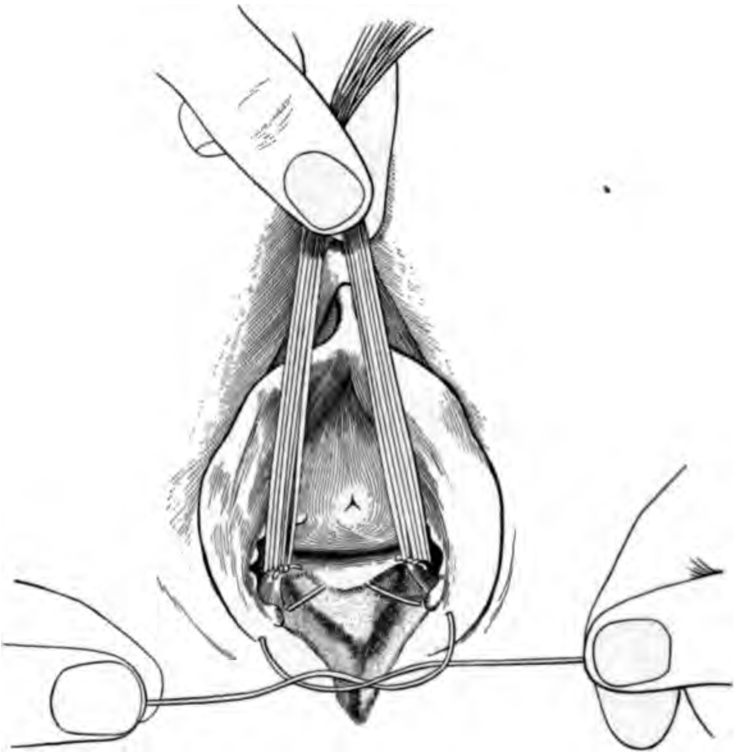
Preparation.—The instruments needed for this operation are a small scalpel, needle-forceps, long dissecting-forceps, four pairs of light tenaculum forceps, half a dozen hæmostats, long-handle scissors curved upon the flat, suture material, preferably silkworm gut, and small or medium-sized catgut. To prepare the patient for operation the bowels must be very thoroughly emptied in the manner already described. If it be found that the sphincter of the bowel is weakened, special care must be taken to have the intestine completely emptied, and to secure this the patient should be given such food for several days before the operation, that there will be little if any residue in the intestine. Such diet is preferably broth, soup, beef tea, soft egg, with a moderate amount of toast or bread and a little tea or coffee. The field of operation should be prepared by removing the hair which may become soiled, and by douching the vagina with the green soap and creolin mixture already described, alternating with douches of bichloride of mercury, 1:2,000. The cervix should be examined with the speculum, and, if a mucopurulent discharge is present, the cervix should be swabbed out with bichloride, 1:1,000. As the operation may last for an hour or an hour and a half, the patient should have a stimulant before taking the ether, preferably whiskey or brandy, while stimulants should be at hand for hypodermatic use if needed. If assistants are not available, the operator should have a convenient form of leg-holder, so arranged as not to make undue pressure upon any portion of the patient's limbs. The patient should be placed upon her back at the edge of the table and the field of operation surrounded by sterile linen. The operator's instruments should be made fully aseptic, and he should take every precaution regarding the disinfection of his hands and the cleanliness of his clothing.

Method.—The operator should first map out the field of operation by grasping, with a pair of tenaculum forceps, the point in the middle



begins. If moderate tension is made upon each of these forceps, by examination it will be seen that the form of the surface to be denuded rudely represents a butterfly with extended wings, and that the tip of each wing represents the point in the sulcus at which the original tear began. The operator should then grasp the mucous membrane just below the upper and central tenaculum, and with his scalpel outline the flap for denudation by cutting lightly through the tissue in a line extending between each of the tenaculum forceps.

FIG. 252.

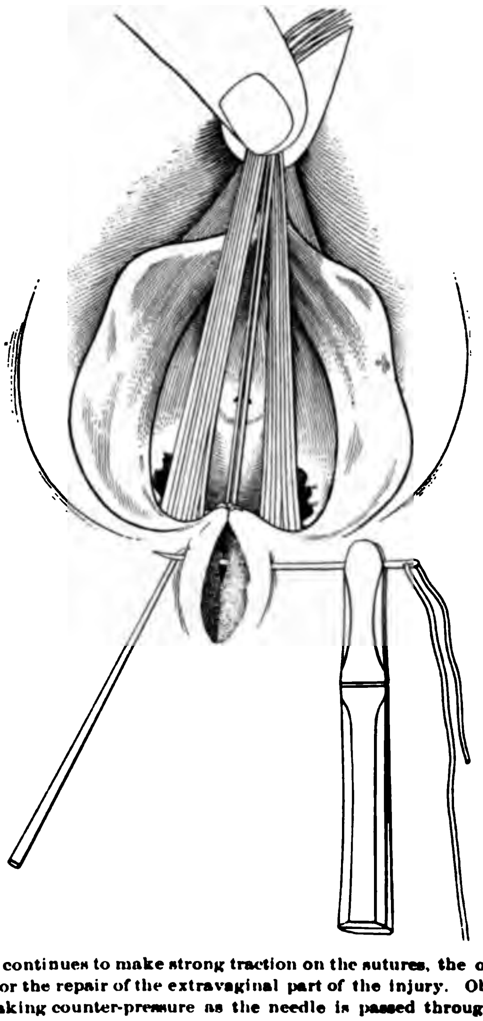


The sutures in the two lateral sulci have all been passed and tied in the manner indicated in the two preceding figures; their free ends, as before, are being strongly pulled upward by the nurse while the operator is tying the crown stitch. This stitch when tied will bring the two lowest caruncles and the crest of the rectocele together, and will complete the introvaginal part of the operation. All sutures are introduced and tied under a constant stream of hot sterilized water. (DUDLEY.)

Having outlined the flap, he may begin at the highest point of the sulcus upon his left hand, and gradually dissect up the flap of the thickened mucous membrane following the outline. Some operators prefer to use a scalpel for this dissection, while others begin the raising of the flap with a scalpel and then employ scissors, sharp-pointed and curved upon the flat.

Care should be taken not to buttonhole the flap, as this results in imperfect freshening of the tissues, and may lead to imperfect union. When the dissection is complete any small vessel which may spurt should be caught by hæmostatic forceps and twisted. Ligature of such vessels is rarely necessary, but should be done with the catgut if required.

FIG. 253.



While the nurse continues to make strong traction on the sutures, the operator is introducing the first suture for the repair of the extravaginal part of the injury. Observe the action of the tenaculum in making counter-pressure as the needle is passed through. Notice also that the needle is shown at the bottom of the wound. The general rule in plastic surgery, to bury the suture completely under the wound, although favorable to union, is disregarded in the passage of these outside sutures, for if so buried they would include and draw forward into the restored perineal body the crest of the rectocele. This rectocele is a portion of the rectovaginal wall, and if not included in the sutures will take its normal place back of the restored perineum. (DUDLEY.)

In passing the sutures to unite the tissues, the physician should begin at the top of the lateral sulci and close the tissues by interrupted suture of silkworm gut until the line of suture comes to the central line of the vagina. A similar procedure should be carried out upon the opposite side. A crown stitch should then be passed, beginning upon the left side at the point in the sulcus suture nearest the perineum, passing beneath the tissues and emerging in the middle line, then entering the tissue again until it emerges upon the right side of the patient at the lower portion of the sulcus suture. The purpose of this stitch is to draw together the lower portion of the vaginal tissue and to fit it accurately upon the line of suture which is made by closing the skin perineum. This stitch should not be tied until the perineal stitches have been inserted and the lower ones have been tied.

The tear is now converted into a simple laceration of the perineal body in the central line. This should be closed by interrupted stitches of silkworm gut, and the stitches should begin at the last point of the denuded surface nearest to the rectum. These stitches should be carried upward until they meet the two lines of suture from the lateral sulci. The tissue which forms the tip of the central portion of the denuded area should then be brought down into the central line, so that the last stitches shall include this tissue in their circuit. In passing the first stitch of this central line, namely, that next the bowel, care should be taken to pass the needle sufficiently deeply to bring together any torn portions of the fascia and muscle forming the sphincter of the bowel. If needed, the sphincter should be brought together by buried catgut. These stitches in the central line may be of silkworm gut. They should be left long and the ends tied together in a knot. Before the stitches are tied the tissues should be thoroughly douched with bichloride solution, 1:8,000, or lysol or creolin, 1 per cent. The crown stitch is usually the last one to be tied. The parts should then be freely powdered with iodoform and boric acid and the vulva covered with an occlusion dressing of antiseptic gauze.

After-Treatment.—The after-treatment of these cases is usually uncomplicated. If difficulty is experienced in urination, the patient may be catheterized every eight hours. The stitches should be kept thoroughly clean by a spray or irrigation of boric acid, a teaspoonful to the quart of hot water; by bichloride solution, 1:8,000; or by a salt solution, two teaspoonfuls to the quart. The stitches should be cleansed after each micturition and defecation, averaging two or three times in twenty-four hours. The parts should then be thoroughly powdered with iodoform and boric acid and the vulvar dressing renewed. The patient's bowels should be kept closed after the operation for twenty-four hours by the injection of codeia, one-half grain hypodermatically, and repeated if needed, or by the insertion in the rectum of an opium suppository, for which the following is a useful formula:

Aqueous extract of opium	gr. ½.
Extract of belladonna	gr. ⅛.
Iodoform	grs. 2½.

Cocoa butter sufficient to make a rectal suppository.

Convalescence.—The after-history of these patients is usually uneventful. The stitches may be allowed to remain for ten days or two weeks. They should be removed with antiseptic precautions and the vagina thoroughly douched after their removal. A discharge of bloody serum is usual in these patients during the first five or six days after the operation. If thorough antiseptic precautions have been taken, the patient will have no fever, nor will a purulent discharge be formed. The patient should remain in bed at least two weeks after the operation. The bowels should be moved on the second day; although there is not much danger of injuring the sphincter in these cases, still the precaution should be taken before the first fæcal matter is expelled to inject into the rectum four to six ounces of warmed olive oil. After the bowels are thoroughly emptied the patient's diet may be increased.

The complications which may arise after this operation are hemorrhage and septic infection. It is rare for the bleeding to assume dangerous proportions, as no large vessel is severed. Persistent oozing, however, requires the application of antiseptic gauze and a tampon.

The patient should be convalescent from this operation in three weeks and able to sit up by that time.

Secondary Operation for the Complete Tear.—When the septum between the vagina and rectum has been opened the tear is said to be a complete one, and the rectum and vagina open with the same orifice. In these cases there always ensues some loss of tissue through absorption of the bruised and torn tissues just above the rectum. As a result of this the operator will find the torn ends of the sphincter considerably retracted, while above the opening of the bowel occurs an oval opening, which is seen to be the common joining of the rectum and the vagina. In many of these cases the condition of the patient is a very pitiable one. The mucous membrane of the rectum often becomes very irritable, and attacks of obstinate diarrhœa greatly weaken the patient. Some women are so troubled with persistent diarrhœa that they are obliged to limit the diet during the warm months of the year to liquids, especially avoiding milk on account of the formation of its curd. Another difficulty is found in the fact that the ends of the torn sphincter muscle are considerably atrophied, and hence the operator is dealing with weakened and attenuated tissues as well as with the torn and injured muscle. The after-care of these patients requires good nursing and thorough antisepsis, and hence operation for the relief of these cases should not be undertaken unless such assistance can be procured. Many women are content to suffer from this complication rather than to undergo the inconvenience and prolonged confinement to bed after an operation.

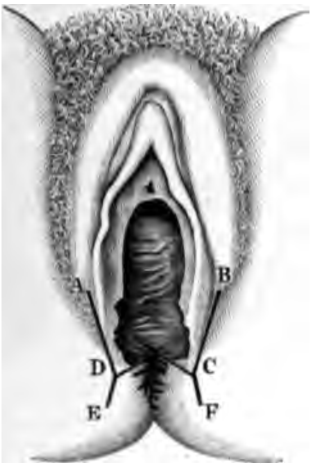
Preparation.—The instruments required for the closure of a complete tear of the pelvic floor and perineum are the same as already described in dealing with the incomplete or partial laceration. As the operator will be obliged to bury a portion of the suture, he must select catgut in which he has absolute confidence, or if he cannot obtain that which he knows to be aseptic, he had better rely upon thoroughly boiled silk. This for buried sutures should be of small size and not of the firmest and closest texture. The needles required for this operation are short, fully-curved needles for the continuous buried sutures, and large, fully-curved needles for the interrupted sutures which complete the operation. As it is not unusual to open small vessels, fine silk or catgut suitable for ligature should be available. A clean catheter should be at hand, and, if the operator prefers, a long piece of rubber tubing to drain the bladder continuously for a few days.

The preparation of these cases requires careful attention to the intestinal canal. The patient should be put to bed for four or five days before the operation. Her bowels should be thoroughly emptied by calomel and soda at night followed by a saline in the morning, until the tongue is perfectly clean and the abdomen perfectly flat. Her food meantime should be chicken broth, mutton broth, beef tea, beef juice, soft egg, small amount of bread and toast, and a limited amount of tea or coffee. Plenty of water should be taken. It is always good surgery to examine the urine of a patient who is to be anæsthetized for a considerable time, and should evidence of kidney failure be present this must be remedied by appropriate treatment. The parts should be made thoroughly aseptic by shaving and by scrubbing with tincture of green soap, copious douching with boiled water and copious douching with lysol, 1 per cent. The mucous membrane of the rectum should be irrigated as well as that of the vagina, in order, if possible, to prevent the passage of bacteria into freshly-cut surfaces. The patient should be anæsthetized by ether, having been prepared by shaving the hair away from the parts, thoroughly scrubbing them with soap and water, rinsing with water, scrubbing with bichloride, 1 : 2,000, and again with alcohol. The physician must thoroughly sterilize his instruments by boiling with soda for half an hour and placing them in carbolic solution, 2 per cent., or in sterile water. He will require a small amount of antiseptic gauze, cut into convenient strips for tamponing, and also a supply of iodoform and boric acid and bichloride gauze. Some operators prefer to use marine sponges suitably antisepticized, while others attach to the hose of a fountain-syringe a finely-drawn nozzle which permits a very fine stream of sterile water or salt solution to play upon the parts.

Method.—The patient should be placed upon her back at the edge of a table and her thighs held by assistants or by a suitable leg-holder. The plan of operation which is most feasible to the greatest number of cases and which has the advantage of removing no tissue, consists in splitting the tissues between the rectum and the vagina, thus separating these two canals.

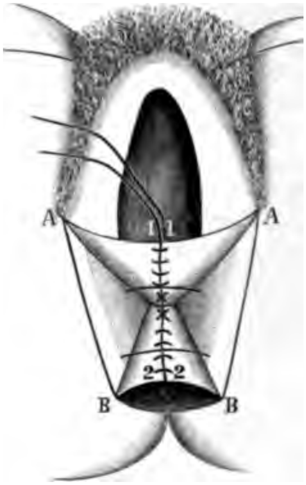
If this be done, the posterior wall of the vagina can be raised and drawn upward and backward, while the anterior wall of the rectum should be drawn downward and forward. This anterior rectal wall has been torn in the central line by the birth of the child. The first province of the physician in suturing must then be to bring together the two lateral halves of this anterior wall by continuous suture, which is to be buried. In order to loosen the anterior and posterior flaps it is necessary to make an incision upon each side of the vagina just at the inner border of the cutaneous surface, where the tissue of the skin becomes the mucous and cutaneous tissue at the edge of the vagina. These incisions should be prolonged upward to the lower border of the lesser labia. At the point where the rectum and vagina join these incisions are turned transversely toward the median line, to loosen the two flaps. When this is completed, the lateral incisions are then prolonged downward and slightly outward, in order that the torn ends of the sphincter muscle may be loosened and made available for suture. This dissection is sometimes accompanied by hemorrhage, but the vessels rarely need more than torsion by hæmostatic forceps. The lines of the flaps must be made by a sharp, small scalpel, while the dissection itself can be accomplished with the knife or sharp-pointed scissors curved upon the flat.

FIG. 254.



A D, B C. Lateral incisions at labial border. *D E, C F.* Prolongation of these incisions to loosen ends of sphincter muscle. At points *D* and *C* incisions are carried toward central line to split recto-vaginal septum.

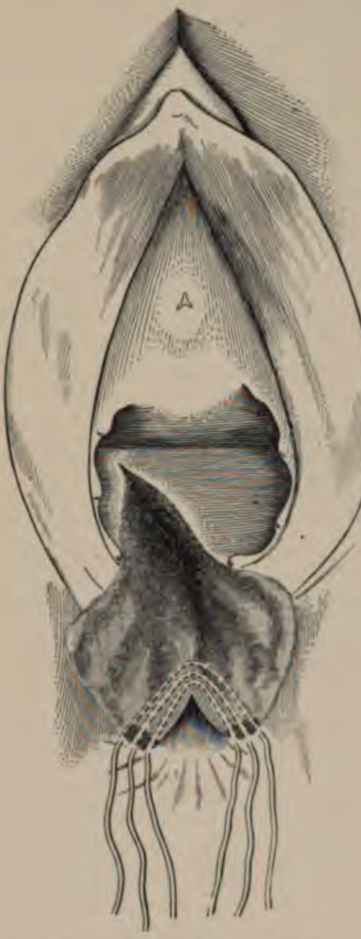
FIG. 255.



Closure of complete laceration. *A B, A B.* Lateral incisions. 1 1. Continuous suture, closing flap, making new posterior vaginal wall. 2 2. Continuous suture, closing flap, making new anterior rectal wall.

CLOSURE OF THE BOWEL.—When the flaps have been thus separated, as has been stated, the first province of the operator is to begin his line of suture at the highest point of the rectal tear and bring together the tissues of the rectum. For this purpose he should select a small, fully-curved needle, round or Hagedorn, and threaded with fine catgut or fine silk. His first stitch should begin just above the point of laceration and should be passed through the tissue above the mucous membrane, endeavoring if possible not to open into the lumen of the bowel. This stitch should be tied and the suture material held lightly by an assistant. With dissecting forceps the operator then brings together the two edges of the torn rectal tissue, uniting them with the continuous over-and-over stitch. He thus repairs the torn rectal wall down to the sphincter. If the ends of this muscle are

FIG. 256.



The purse-string method of suture. This draws the wound into a small compass; it leaves no part of a suture in the bowel to absorb and carry septic secretions; the inner angle of the anal portion of the wound is drawn down to the margin of the anus, where it is less liable to infection than if the wound were longer and exposed to the interior of the bowel. (DUDLEY.)

plainly found, he may bring the muscle together by this continuous stitch. If not, it is well simply to join the mucous membrane of the rectum, leaving a full dissection to expose the muscle. The lower end of the rectal stitch should not be tied, but the needle and unemployed suture should be wrapped in antiseptic gauze and intrusted to the assistant. Selecting a freshly cut, continuous suture, the operator should then begin at the upper point of the mucous membrane of the vagina, which is raised and drawn gently upward and backward by a light tenaculum forceps. Beginning at the uppermost point the operator then brings together these tissues by continuous suture, making the approximation as accurately as possible. As the tenaculum forceps draws the tissue upward and backward the line of suture gradually covers up the mucous membrane of the vagina, and carries upward and backward the point of redundant tissue which formed the anterior surface of the rectocele. This line of suture in the mucous membrane of the vagina is usually longer than that in the rectum, and when completed has repaired the floor of the vagina to the extent of the original laceration. This continuous vaginal suture should not be tied at its lower point, but, if possible, the needle should be wrapped in gauze and held until the other sutures are inserted.

Closure of the Pelvic Floor.—The operator has now converted the complete laceration into an incomplete. There remains a quadrilateral figure whose sides are formed by the cut edges of the skin in the lines of incision whose upper portion or head is the newly-made wall of the vagina, while its lower portion or base is the recently repaired rectal wall. This space is to be closed by bringing together the skin edges, and this is accomplished by interrupted sutures. Chromicized catgut of medium size is best adapted to this purpose, and a fully curved, large needle, round or Hagedorn, is to be used. The first and most important stitch is at the lower end of the surface, and should be so passed as to include the sphincter muscle. It is necessary in placing this suture to go down upon the sides of the intact portion of the muscle, in order that the ends of the muscular tissue should be gathered up and brought well together toward the middle line. The needle should be introduced upon one side, the sixteenth or eighth of an inch from the edge of the skin surface, and should be passed sufficiently deeply to include the sphincter and also the connective tissue above the mucous membrane of the bowel. The needle should pass just above the line of continued suture by which the operator closed the mucous membrane of the rectum, and the operator should avoid, if possible, penetrating the bowel with this suture. If this is carefully passed, it will bring together the fascia and muscle tissue of the sphincter, and will form a most efficient means of securing union. If sufficient dissection has not been already made to secure this result, the operator should prolong his incisions downward and outward, and also backward into the vesico-rectal region until the sphincter is perfectly free. When this stitch has been passed the remaining portions of the ununited skin edges should be brought together by interrupted chromicized catgut or silkworm gut stitches placed one-eighth to one-quarter of an inch apart. To pass these stitches the needle should be introduced sufficiently far from the edges of the cut skin to secure a firm hold, and the needle should be carried downward, emerging in the centre of the space below, re-entering and again emerging upon the opposite side. If the needle is passed at each stitch, not only downward through the tissues, but also a little upward and backward, a better result is obtained. When these stitches have been placed they should be tied, beginning with the last one from below upward. If any ununited surfaces are left when these stitches are tied, the continuous suture at the lowest extremity can be utilized in joining them, and also the continuous suture at the upper extremity. If the dissection at the sphincter muscle has left ununited surfaces, an additional interrupted stitch of catgut may be needed to repair them. The stitches are then cut, when the vagina and rectum are douched with bichloride, 1 : 8,000, and the surfaces are freely powdered with iodoform and boric acid. Hemorrhage during this operation is generally inconsiderable and should not embarrass the operator. The patient's knees are then brought together, a pad placed between them, and her legs bandaged at the knees and also at the ankles; a vulvar occlusion dressing is retained in place by a T-bandage. The bladder should be catheterized at the completion of the operation. If suitable care cannot be obtained, the bladder may be continuously drained by catheter for the first few days. As a rule, however, it is better not to employ this expedient.

After-Treatment.— Cases are occasionally seen in which a patient upon whom this operation has been done, upon waking from the anæsthesia, becomes partially delirious, complaining of acute pain, and by straining and bearing-down efforts may tear asunder the recently-united tissues and produce severe hemorrhage. This may happen especially in hysterical and nervous patients. To obviate this the patient should be given a hypodermatic injection of one-quarter grain of sulphate of morphine combined with $\frac{1}{200}$ of a grain of atropine. Some operators prefer to employ codeia, giving one grain by hypodermatic injection, while others use rectal suppositories of aqueous extract of opium. Such may be made after the following formula:

Aqueous extract of opium	gr.	1.
Extract of belladonna	gr.	¼.
Iodoform	grs.	2½.

Cocoa butter sufficient to make one rectal suppository.

Others prefer the ordinary rectal suppository of the Pharmacopœia, containing one grain of opium. The patient is then placed in bed on a moderately-hard mattress, and should be attended by a nurse until she is perfectly conscious after the operation. The presence of the nurse will prevent violent or straining movements, and often control at this time is essential for the success of the operation. The fact that many of the sutures pass through the skin in one of the most sensitive parts of the body seems to predispose a nervous patient to intense pain immediately after the operation. The patient should be given sufficient morphine or codeia to relieve her pain and to prevent the passage of the bowels for three days. With trustworthy nurses the nurse may be intrusted to give a hypodermatic injection of one-eighth grain of morphine as often as is needed. If no such trustworthy person is at hand, the physician must prescribe the dose at stated intervals, seeing his patient as often as is necessary for the first three days. The patient should be catheterized every eight hours unless the bladder is continuously drained. She may be cautiously turned upon her side, but the knees and legs should remain bandaged together. Her diet should consist entirely of food which will leave little or no residue in the intestine, and should be essentially that which she had while preparing for the operation. Hemorrhage rarely occurs as a secondary complication unless the patient has become uncontrollable and torn the tissues asunder. The after-care of the sutured surfaces in these cases consists in keeping them scrupulously clean with antiseptic applications. Many prefer not to use douches with these patients, but every eight hours, especially after micturition or defecation, to cleanse thoroughly the parts with lysol, 1 per cent., and then to powder them freely with boric acid and iodoform. Others prefer to use a spray of normal saline solution or bichloride, 1:8,000, or carbolic acid, 1 per cent., followed by the use of antiseptic powder. A vulvar occlusion dressing of bichloride gauze, 1:2,000, and a borated cotton pad should be constantly worn and kept in place by a T-bandage.

Moving the Bowels.—The first movement of the bowels after such an operation is a matter of great importance. The operator should prepare the patient by administering laxatives of such a nature as will completely soften the fecal matter to be passed. It is well to give on the night preceding the moving of the bowels a grain of calomel with two or three grains of sodium bicarbonate. On the following morning the patient may take a bottle of citrate of magnesia in two or three doses, or she may take a half-ounce of Epsom or Rochelle salt. A nurse should be in constant attendance, and as soon as the patient has an inclination for a bowel movement the nurse should very carefully inject into the rectum, through an English catheter or a small rectal tube, four to six ounces of warm sterile olive oil. This should be passed up as high as convenient, and the injection should be given slowly and with great gentleness. This will usually result in protecting the rectal surfaces, insuring the smooth passage of feces and preventing straining and injury to the parts. It is well to gently douche the rectum with normal salt solution after the bowel movement. If the first bowel movement is successfully accomplished, the bowels may be moved every second day thereafter for the next four to six days. The patient's diet may be somewhat enlarged, to include soft egg, a small amount of easily-digested meat, and a moderate amount of fresh fruit in season. A large amount of vegetables should be avoided, and the patient should be given laxatives sufficient to insure a soft condition of the feces. The oil injection should be practised before each bowel movement for the first eight days after the operation.

Convalescence.—The operator must not be surprised if the patient does not immediately regain control of the sphincter muscle. In many cases it is ten days or two weeks after the operation before great improvement in this direction can be observed. If, however, the wounds do not become infected and a good union is obtained, the gradual contraction of the tissue will usually give to the patient a satisfactory control over the bowel. The stitches should be removed in ten days to two weeks after the operation. To accomplish this the patient should be placed upon her back upon a suitable table and in a good light. The operator will require for the removal of the stitches one or two pairs of hæmostatic forceps, a curved director, and long-handled scissors, sharp at the point. The patient's thighs should be separated by assistants or by a leg-holder. The removal of the stitches in the skin perineum is an easy matter. As regards, however, the continuous sutures, the operator may cautiously endeavor to remove the knot at the upper portion of the vaginal suture if it be found remaining. The same is true of the knots at the lower portion of this suture, and also any knots of continuous suture which may be found about the rectum. Under antiseptic precautions and with good nursing the results of this operation are excellent.

The patient should remain quietly in bed for three weeks after the operation. On the fourth week she may sit up in bed and be about for a portion of the day. At the end of four weeks she may be up and about, and at the end of six weeks she should be thoroughly convalescent. The patient should be cautioned to avoid sexual intercourse for a number of months after this operation, lest injuries to the tissues might occur and newly-healed surfaces be torn asunder.

Septic Infection.—Should septic infection occur after secondary operation, the stitches must be carefully inspected and those whose tract is evidently infected must be removed. The track of the stitch must be thoroughly cleansed with hydrogen peroxide, and those stitches which remain uninfected should not be removed. Fistula will occasionally follow the infection of one or two stitches, but this will finally close if the parts be kept thoroughly clean.

The Secondary Operation for the Results of Injury to the Anterior Segment.—Cases are occasionally seen in which patients after labor suffer from protrusion of the anterior vaginal wall and also of the tissues about the urethra. The first is termed cystocele, and is usually the result of hard and continued labor in a weak and poorly-developed patient. It is accompanied by a prolapse of the uterus to some extent, and is annoying to the patient, because the prolapsed portion of the bladder allows the retention of urine, which readily becomes partially decomposed, giving rise to unpleasant symptoms of irritation. The symptoms of cystocele are a tumor between the labia and irritability of the bladder, with pain at the time of micturition. The cure of this condition is by operation only. It has no palliative treatment that is worthy of consideration.

Preparation.—To prepare a patient for this operation the bladder should be thoroughly douched with a 1 per cent. solution of lysol night and morning for several days. This is readily accomplished by a soft catheter to which are attached by glass tubing a funnel and connecting tube. If the bladder be distended with the antiseptic, the fluid may be siphoned off without difficulty. The parts about the vulva should be washed and the vaginal mucous membrane thoroughly disinfected by the use of green soap and lysol as advised in treating of operation upon the posterior vaginal wall. The question as to permanent drainage of the bladder will depend very much upon whether any condition about the urethra is found calling for operation at the same time that the cystocele is treated. If no such condition is present, the bladder should not be continuously drained. The instruments required for the operation are a small scalpel, scissors curved upon the flat, hæmostatic forceps, four pairs of light tenaculum forceps, dissecting forceps, needle-holder and needles, preferably curved, while a large depressor or speculum may be useful in depressing the posterior wall of the pelvic floor. The instruments should be thoroughly sterilized, and also the arms and hands of the operator. The patient should be anæsthetized by ether, the bladder being emptied and douched, the parts made thoroughly clean and aseptic, and the field of operation surrounded by sterile linen.

Method.— The operator, when seated before his patient, has her thighs separated and carried backward, which exposes the field of operation. The retractor having been placed in the posterior wall of the vagina, the anterior wall will be seen protruding. The operator carefully selects four points upon this tissue. It is often impossible to ascertain the presence of scar tissue in the anterior vaginal wall which would indicate a laceration at the time of labor, and the best that can be done is to determine upon the size of the flap of hypertrophied tissue which the operator proposes to remove from the surface of the cystocele. This is to be ascertained by grasping with tenaculum forceps at the highest point in the median line, to which the dissection is to be carried, by selecting also the lowest point in the median line, and by placing tenaculum forceps midway between these two points on either side at the outermost edge of the proposed denudation. These forceps should be intrusted to assistants, who should make gentle but constant tension upon the instruments. When these are drawn partially tense, it will be seen that a diamond-shape figure has thus been outlined. Operators usually prefer to make the shape of the dissection an ovoidal one rather than to adhere to the straight lines of the diamond. The operator should grasp the tissues just below the highest tenaculum forceps with the dissecting forceps, and with the scalpel dissect away a flap of hypertrophied mucous membrane. The operator must avoid two dangers—one of cutting too deeply, when he may open the bladder, and the other of cutting too far anteriorly, when he buttonholes the flap. If small vessels spurt as the denudation proceeds, they must be caught by hæmostatic forceps and twisted. Some prefer to employ scissors in the denudation, outlining the flap with a knife. When the dissection is complete the operator must determine the sort of suture to be used with reference to the size of the denuded surface and the condition of the tissues. Where the exposed surface is extensive, it is better to make two lines of continuous suture, forming a strong scar to prevent the occurrence of the original condition. The first should be taken in the central line of the denuded area, occupying fully one-half of its length. The submucous and connective tissue should be covered up by the continuous suture, and brought together by the over-and-over stitch. Catgut is to be used for this purpose. When this is done, the cut edges of the hypertrophied mucous membrane should be brought together also by a continuous suture beginning from the highest point. The result of this operation is to replace the prolapsed portion of the bladder, and to substitute for the stretched and weakened vaginal wall the double line of firm scar-tissue. The vagina should be thoroughly douched and the parts heavily powdered with iodoform and boric acid.

After-Treatment.—No dressing is needed immediately applied to the sutured surface, although some prefer to tampon the vagina lightly with iodoform or bichloride gauze. An occlusion dressing should be worn over the vulva of bichloride gauze, retained in place by a T-bandage. The patient should be catheterized for several days; the parts should be thoroughly douched with lysol, 1 per cent., normal saline solution or boric acid, one teaspoonful to the quart of hot water, after each micturition and defecation. The patient may assume any posture in bed which is comfortable.

Results.—The results of this operation are generally very satisfactory. It is rare for infection of the tissues to occur. The sutures are usually absorbed without difficulty, and, if the patient be examined two or three weeks after the operation, it is possible that even the knots will have disappeared. It is well in these cases to see that there is no malposition of the womb which should cause protrusion of the bladder and the vaginal wall. If required, a pessary should be worn for a little time until the sutured tissues are firmly united.

The Secondary Repair of Injuries About the Urethra.—Occasionally laceration of the anterior segment of the pelvic floor has been sufficiently deep at one portion to cause the formation of a distensible scar and require separate excision and suture. The urethra sometimes prolapses. In these cases, the operator must fit the operation to the conditions present, carrying his dissection in such a manner as to remove scar-tissue and to cover with sound tissue the underlying structures which protrude.

The Closure of Fistulæ in the Genital Tract Resulting from Injury at Labor.—Vesico-vaginal, uretero-vaginal and recto-vaginal fistulæ may result from necrosis, caused by continued pressure in prolonged labor. Many of these cases occur in contracted pelvis, where the head descends sufficiently to make pressure upon the soft parts and becomes impacted.

Signs and Symptoms.—The symptoms of fistulæ are the escape of urine or feces from their natural channels into the birth canal. Usually these foreign substances find entrance to the vagina; occasionally a fistula may be so situated as to communicate with the cervix uteri. In most cases the patient notices the presence of urine or feces in the vagina upon recovering from labor.

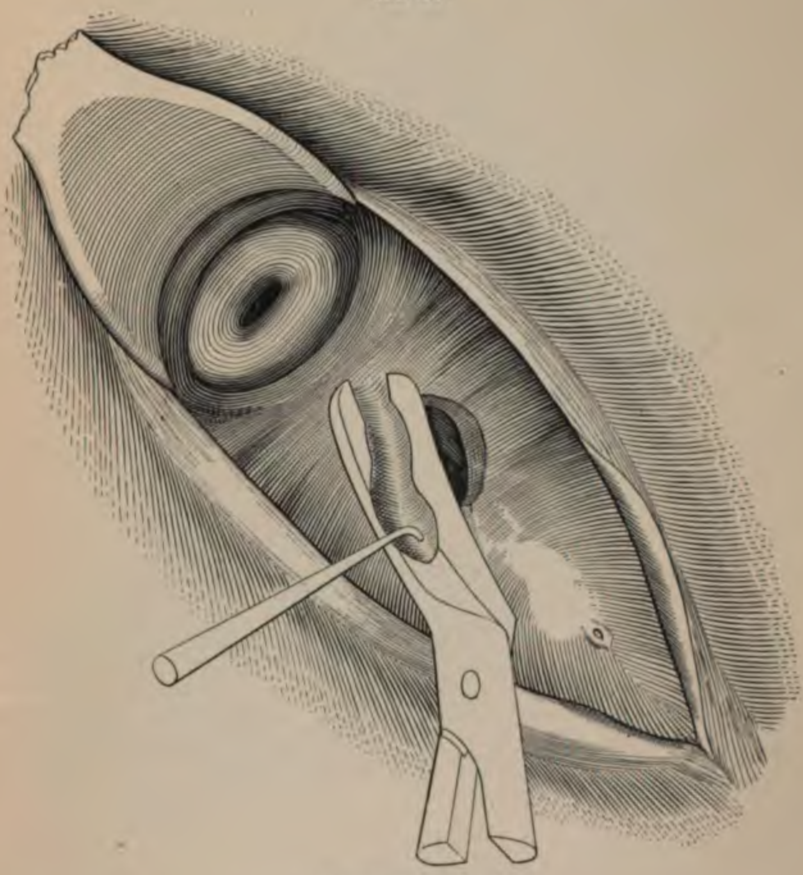
Diagnosis.—The presence of a fistula may be recognized and its location ascertained by direct examination. If the parts are exposed by specula, the fistula can usually be detected without especial difficulty. In some cases the patient must be placed in postures especially favorable for dilating the birth canal, and fluid easily recognized may be injected into the bladder or rectum. If a fistula exists, this fluid will make its appearance in the vagina.

Pathology.—Urine and feces undergo decomposition within the vagina, irritating and excoriating compounds form, bacteria penetrate the tissues and a chronic infection and inflammation result. The patient suffers greatly from itching, burning and unpleasant sensations, and from the unpleasant odor and frequent micturition which complicate the case. Her presence becomes obnoxious to others, and she may be prevented from earning her living or from mingling in society. Infection sometimes attacks the deeper layers of the bladder, setting up cystitis and in some cases other portions of the urinary tract are invaded and even the kidney may not escape. If an acute process is not set up, the patient suffers indefinitely from chronic inflammation, while the effect upon the mind is most depressing.

Preparatory Treatment.—The preparatory treatment of fistulæ consists in local antisepsis of the cavities communicating to give the best possible chance for healing after operation. The rectum should be freely and frequently irrigated with normal salt solution, the bladder should be repeatedly douched with a saturated solution of boracic acid. Fecal matter should be removed from the bowel by purging, while the urine should be rendered as nearly normal as possible by selected diet and the plentiful use of water. The vagina should be made as aseptic as possible by hot douches of 1 per cent. lysol, creolin or boracic acid. The patient's general condition should be made as good as possible.

Operative Treatment.—There is no efficient treatment for fistula except surgical operation. Very small fistulæ sometimes close spontaneously if the edges are kept clean by the preparatory treatment described. All fistulæ of considerable size must be cured by operation. The principle upon which operation is based consists in freshening the edges of the fistula, dissecting loose, if necessary, scar tissue to prevent tension and closing the edges of the fistula by suture. For many cases Sims' position is most available. For rectal fistula the dorso-lithotomy position is usually employed. In some cases of fistula situated in the region of the cervix, the fistula may not be accessible through the vagina, and it may be necessary to open the bladder by suprapubic incision and thus to insert stitches through the bladder wall.

FIG. 257.



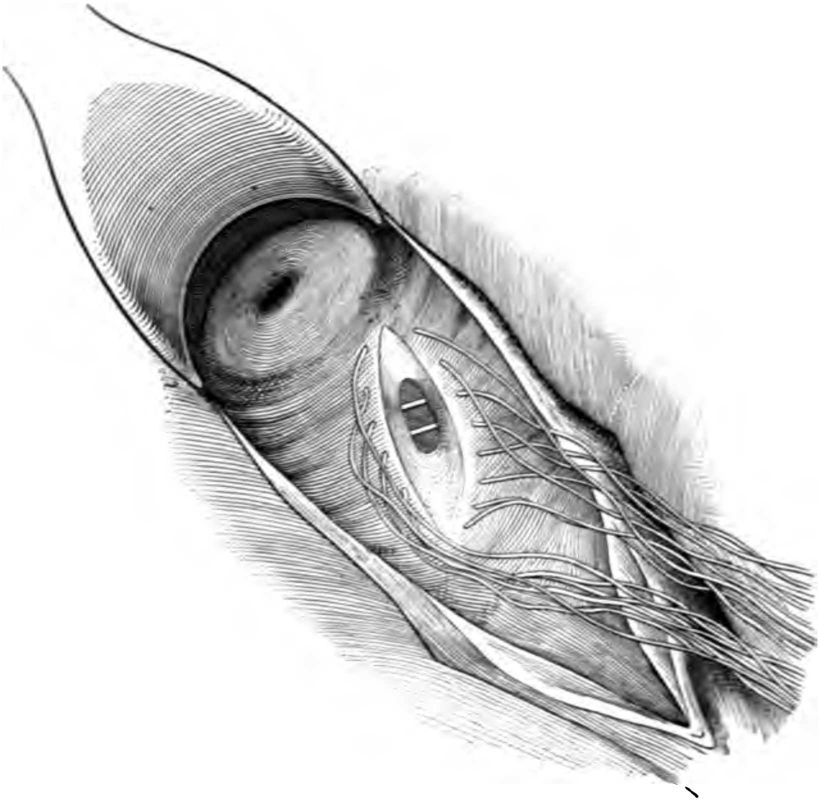
Vesico-vaginal fistula.

The use of the uterine tenaculum and Emmet's scissors in denudation. Left latero-prone position; exposure by Sims' speculum. (DUDLEY.)

Suture material usually employed for such operations is catgut prepared to remain in the tissues for a considerable time. Silver wire may be used if the fistula is accessible, permitting the removal of the stitches.

After-Treatment. — The after-treatment of these cases is most important. The bladder should be continually drained by a catheter and tubing, and should be kept in an aseptic condition by daily irrigation with saturated solution of boracic acid. The bowels should be irrigated daily with normal salt solution. The urine should be kept in a normal condition by appropriate diet and by simple remedies. Fecal matter should be reduced to a minimum by appropriate diet and bowel movements should be made soft by laxative medicines. Patients do not, as a rule, suffer much pain after these operations and under aseptic precautions the results are usually good.

FIG. 258.

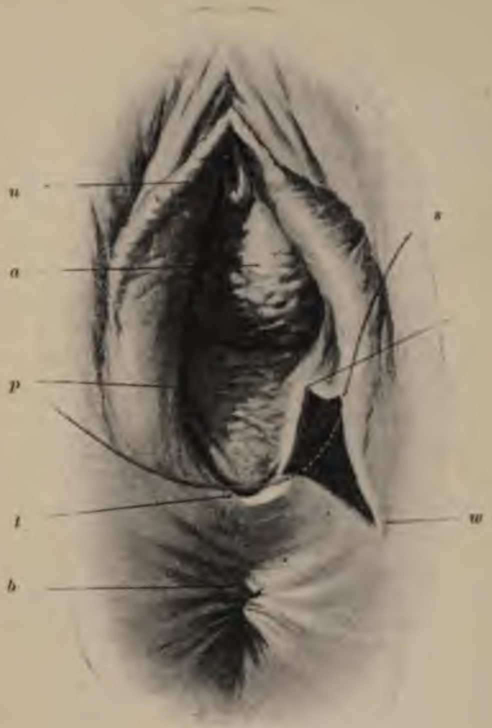


Vesico-vaginal fistula.

The proper area of denudation. The denuded surfaces correspond to the **deck and the fistula to** the manhole of a canoe. Left latero-prone position; exposure by Sims' speculum
DUDLEY.

The Repair of Episiotomy Wounds.—The performance of episiotomy is followed by the separation of the tissues making a triangular raw surface, whose apex is downward and outward and whose base is upon the inner side of the labium. To close these wounds stitches must be taken in two directions for accurate approximation. The first sutures should be inserted upon the inner aspect of the labium to the termination of the mucous membrane. A few additional skin sutures, bringing together the cutaneous surface, will complete the closure. It is convenient to close episiotomy wounds with chromicized catgut which lasts sufficiently long and which need not be removed.

FIG. 259.



Closing episiotomy wound. (BUMM.)
u. Urethra. *a.* Anterior vaginal wall. *p.* Posterior vaginal wall. *s.* Stitches. *t.* Posterior commissure. *b.* Anus. *w.* Outer end episiotomy wound.

CHAPTER XV.

TREATMENT OF HERNIA AND OF DISPLACEMENTS OF THE PELVIC ORGANS FOLLOWING LABOR.

Ventral Hernia.—Cases are occasionally seen in which the abdominal wall does not undergo a normal involution after labor. This may not go to the actual point of hernia; but if the patient's occupation exposes her to constant standing, and if her clothing is improperly adjusted, a hernia may develop. This condition is the result of atrophy and dilatation of the recti muscles, with the protrusion between them of mesentery and peritoneum and sometimes intestine. It exposes the patient to constant annoyance from the presence of the tumor, and the condition disturbs the peristalsis of the intestine, while the hernia tends constantly to increase, and strangulation is always a possibility. In view of these facts the cure of this condition when well pronounced is desirable.

Palliative Treatment. — In ventral hernias of slight extent the patient may derive comparative comfort from the wearing of a suitable pad and bandage. The pad should be preferably of some elastic but soft material, such as a cushion of horse hair covered with flannel, or a perfectly smooth object, like a pad of hard rubber. It is best retained in place by a completely-fitting body, which is supported from the shoulders, and which is prevented from drawing up by two bands passed beneath the groins. Other forms of bandage are rarely efficient, compressing the tissues imperfectly. The constant tendency of any abdominal bandage is to slip up toward the axillæ, at once defeating the purposes for which it is worn.

Differential Diagnosis. — In diagnosticating a condition of ventral hernia, and especially before deciding upon operation, it must be distinguished in diagnosis from other abdominal tumors. Ovarian cysts, hydatid cysts of the abdominal cavity, aneurism of the abdominal aorta, and phantom tumor of the abdomen may occasionally simulate ventral hernia. The differential diagnosis is to be made by palpation, when the tumor if hernia can be reduced, the edges of the ring plainly felt, and the sac grasped by the fingers of the examiner. Coughing gives a marked impulse to the hernia, while the absence of fluid waves proves that it is not dropsy or ovarian cyst.

Operative Treatment. — The operative treatment of ventral hernia is most satisfactory in its results. If the patient be very much emaciated and in very weak health, she should be gotten into fairly good condition before an operation is performed. If this be not done, cicatrization will be less firm and complete, and the danger of the recurrence of the hernia will be very much greater. The presence or absence of adhesions in such a hernia can never be absolutely foretold. As a rule, adhesions are not present, although they may be encountered. The preparation of the patient for operation consists in thorough purgation by mercury and by salines. The patient's diet should be confined to broth and soup, a small amount of bread, or an egg for two days prior to the operation. The abdomen is to be prepared by very thorough scrubbing with soap and water, with special attention to the umbilicus. This should then be rinsed and scrubbed again with sterilized water, followed by cleansing with bichloride, 1 : 2,000, and last by alcohol. If the umbilicus resists cleansing, ether should be employed to dissolve any retained secretions of the skin at that point. A gauze antiseptic dressing should be placed upon the abdomen after it is cleansed. The instruments required for the operation are knife, scissors, hæmostatic forceps, curved and straight needles, needle forceps, and tenaculum or dissecting forceps. The suture material employed should be silk, fine and coarse, or catgut, if that which is absolutely sterile can be procured. The dressings required will be bichloride gauze, and strips of adhesive plaster, three inches wide and half a yard long, should be in readiness. The operator should take all possible antiseptic precautions. When the patient is anæsthetized by ether, she should be placed upon a table having a Trendelenburg attachment, which should be slightly raised. The operator should make an incision over the lowest and most prominent part of the abdomen in the median line, opening the abdominal cavity. It should be remembered that the abdominal wall is exceedingly thin over these tumors, and care should be exercised in making the dissection. The finger should then be introduced and the sac of the hernia thoroughly explored to detect the presence or absence of intestinal adhesion. If these are absent, the operator may enlarge the incision over the entire tumor; while if adhesions are present, he should extend the incision only to the point of nearest adhesion, and he should try gently to separate the tissues by his fingers before incising the abdominal wall. If this is impossible, the incision should be prolonged over the whole extent of the hernia, carried down to the points of adhesion, which should be ligated and cautiously separated. When the sac of the tumor is thoroughly laid open, the next problem will consist in the removal of the sac and the building up of a new wall of the abdomen.

In many cases a mass of omentum is contained in the sac of the tumor, which is adherent. This must be loosened, ligated in sections, and removed. If the amount is not redundant, it may be left and allowed to form the anterior wall of the abdomen, as before. When all adhesions have been separated and the omentum has been dealt with, the operator should introduce a very broad, thin marine sponge, made thoroughly aseptic, or an antiseptic gauze pad, or a sterile towel wrung out of hot water. The purpose of this is to protect the intestines, completely shutting them off during the removal of the sac. When this is accomplished the sac should be excised, cutting around its edges, and entirely removed. The edges of the sac, which are the edges of the recti muscles, should then be brought together by continuous suture, bringing the aponeurosis of the muscles into accurate apposition. This suture may be of fine silk or of sterile catgut. It should be inserted from above downward, and just before its completion the sponge, pad, or towel in the abdomen must be removed. If necessary, the aponeurosis may be loosened from the overlying skin, in order that this portion of the sac may be made as strong as possible. When this has been completed, the skin should next be brought together by interrupted sutures of silk-worm gut. When this is finished, the line of incision should be heavily powdered with iodoform and boric acid, a dressing of bichloride gauze applied with cotton, and adhesive strips placed over the dressing, being attached to the patient's sides. If the strips are properly placed, there will be no necessity for an abdominal or many-tailed bandage.

After-Treatment.—The after-treatment of these cases is usually not attended with complications. The patient's bowels should be moved on the day following the operation, and they should be made to move at least every second day. The stitches should be allowed to remain two weeks before the wound is dressed, the patient meantime assuming any natural posture while recumbent in bed. When the stitches are removed at the expiration of two weeks, the wound is usually found united. The patient should not be allowed to sit up or get up for three or four weeks after the operation. Before walking about, she should be supplied with a proper abdominal bandage. Her return to her usual occupations, especially if she be a workingwoman, should be made as gradually as possible.

Result.—The result of this operation is usually successful, union occurring without special difficulty. The question of a return of the hernia, however, depends considerably upon the general condition of the patient. Women with thin and wasted muscles are especially liable to a second hernia, while the stretching which the tissues sometimes endure in these cases is very great. This is best prevented by avoiding severe exertion, by the wearing of a suitable bandage, and by attention to the general health and condition.

The Prevention of Displacements of the Pelvic Organs Following Labor.—Very much can be done to prevent displacements of the pelvic organs by giving the patient efficient care during and after labor. If lacerations be prevented as much as possible, and those which occur be immediately closed under antiseptic precautions, a most important step has been taken. The improper use of the obstetric binder must be held accountable for some cases of retroversion and prolapse of the pelvic viscera. As involution progresses and the abdominal muscles become firm, the binder may be dispensed with to advantage when the uterus reaches the brim of the pelvis, and a T-bandage to retain the vulvar dressing may be used instead. During the puerperal period the patient should be instructed to turn frequently upon the sides, and also upon the abdomen if she can do so comfortably. A vaginal examination should be made when the lochial discharge ceases, and if the pelvic viscera be found low in the pelvis and displaced, the patient should be put in the knee-chest posture, the posterior segment of the pelvic floor retracted, and the pelvic viscera allowed to gravitate upward and forward. The patient should repeat the knee-chest posture night and morning so long as any danger of retroversion and prolapse exists. It is also essential that measures be taken to secure a good muscular condition in the patient. General massage should correct a tendency to subinvolution in the abdominal wall, and thus indirectly obviate the danger of pelvic displacements. When the uterus is a pelvic organ, the masseuse may teach the patient appropriate motions strengthening the muscles of the lower portion of the body. Care should be taken that the patient does not leave her bed too soon; that she does not go up and down stairs too early in her convalescence, and that she avoids pressure upon the abdomen by improperly adjusted clothing. The ordinary corset should not be used, if possible, for several months after confinement. If these precautions be carried out, cases of displacement of the pelvic viscera following labor will be uncommon. The influence of lactation in securing good involution must not be neglected. Whenever possible, the mother should nurse her child and willingly take the precautions in her diet to secure this result.

The Treatment of Backward Displacements of the Uterus Following Labor: Pessaries. — When, in spite of the precautions already described, the uterus remains retroverted after labor, support may be given by suitable pessaries. If the patient is in the least degree tender and sensitive to manipulation, a hard-rubber pessary should not be used. Carded lamb's wool, boiled in 1 per cent. lysol, should be employed, made into proper shape and size. For the insertion of such a pessary, the patient should be placed in the knee-chest posture, the posterior segment of the pelvic floor retracted by a Sims speculum, and the whole pessary introduced and carried into the posterior fornix. It should then be suitably placed by the finger and allowed to remain for forty-eight hours. At the end of this time it should be removed and the vagina irrigated with lysol, 1 per cent. If the patient's general health be reinforced, this treatment is sufficient to bring the uterus into a position where further attention is unnecessary.

It must not be forgotten that some patients have habitual retroversion, remaining in ignorance of the fact and suffering no discomfort. In these cases, if the uterus is freely movable and small, and the pelvis is free from exudate or adhesions, it may be impossible to replace the womb, and it may be allowed to remain in a retroverted position. In the writer's experience, a patient removed a pessary carefully fitted to correct a retrodisplacement of the uterus because she supposed that it was to be kept in place but a short time. The retrodisplacement immediately recurred, but the patient remained in ignorance of the fact, and considers herself cured. She suffers absolutely no inconvenience from the condition.

Ventro-fixation. — In cases where obstinate retroversion following labor has complicated a diseased condition of the cervix, operation upon the cervix may be supplemented by ventro-fixation of the uterus. This should be done by placing the patient in the Trendelenburg posture, extreme elevation of her body not being necessary. The abdomen is opened in the median line, as nearly over the fundus of the uterus as the operator can discover. The body of the womb is then grasped by tenaculum forceps and brought upward and forward. The posterior surface of the body of the womb is scraped with the scalpel or a blade of a pair of scissors, until the peritoneal covering of the uterus oozes slightly. Two long pieces of silkworm gut, if possible double, are then threaded into a full-curved Hagedorn needle; the sutures are then passed through the abdominal wall and through the posterior surface of the body of the uterus, at the upper and lower extremities of the portion which has been freshened by scraping. The needle should be passed deeply enough to secure a firm hold in the muscular tissue of the uterus. The suture is brought up through the abdominal wall on the opposite side, its extremities being caught by hæmostatic forceps. The second suture is then passed in a similar way at the other extremity of the freshened surface. While the uterus is held up by tenaculum forceps inserted into its posterior surface just below the fundus, the two sutures already described are brought together, bringing the abdominal wall in approximation and turning the uterus upward and forward, so that its peritoneal covering, where it was freshened, is brought in contact with the peritoneal lining of the anterior wall of the abdomen. These two sutures may then be tied, or, if undue tension and cutting are feared, the stitches are not tied, but are passed through lead plates and then through buckshot which has been perforated for the purpose. When the womb has been brought into apposition, the shot are clamped, and thus the stitches are prevented from slipping. Silkworm-gut stitches are placed in the line of the incision and tied. The wound is plentifully sprinkled with boric acid or boric acid and iodoform, a dressing of bichloride gauze and cotton is applied, and the whole is kept in place by a flannel binder or by strips of adhesive plaster. The vagina is also tamponed with gauze with sufficient firmness to assist in maintaining the uterus in its new position.

Many prefer to bury several stitches of medium-sized sterile silk by passing them through the muscle and peritoneum of the abdominal wall, and then through the anterior surface of the body of the uterus at the fundus. In cases treated by this method, and in whom the abdomen has been afterward opened, a ligament of peritoneal and elastic tissue has been found suspending the fundus from the anterior abdominal wall. Should pregnancy occur, this leaves the uterus free to rise within the abdomen, and exerts no bad effect upon labor.

After-Treatment —The after-treatment of these cases is that usually given to an uncomplicated abdominal section. If pain follows the operation, codeia may be given by hypodermatic injection in doses of one-half a grain. The bowels should be moved on the second day after the operation. The stitches should be allowed to remain for two or three weeks. The stitches should then be removed, although the tampon in the vagina should be continued, or else a soft-wool pessary should be worn, for four weeks after the operation.

In doing this operation the operator should remember that it is not necessary to bring the womb up tightly against the wall of the abdomen. What is desired is that the scraped surfaces upon the uterus should become adherent to the peritoneal lining of the anterior abdominal wall. This adhesion will stretch somewhat after recovery, but will be, in most cases, sufficiently firm to alter the position of the uterus very greatly.

Combined Operations. — In the hands of a good operator the curetting, amputation of the cervix, and ventro-fixation may be performed under one etherization. As hemorrhage is but slight, the patient should suffer no especial shock. Pregnancy in such a patient is rarely attended with serious complication. The uterus will gradually rise into the abdominal cavity, and while there may be slight pain, owing to tension upon the peritoneal adhesions, still this is rarely severe. At labor uterine contractions are usually efficient, and, aside from slight irritability of the bladder, which gradually disappears, the after-results of these cases are usually very satisfactory. The attention of the reader is called to the fact that no buried stitches are left by this method of operating, as such might give rise to irritation, and especially in patients who afterward become pregnant. The patient should remain in bed after this double operation for four weeks, and before she gets upon her feet a properly-fitted pessary should be applied. She should wear this for two months after the operation. The stitches from the abdominal wound should be removed in two weeks after the operation, and those which hold the uterus may be left until three weeks if they do not cut or produce irritation.

SHORTENING OF THE ROUND LIGAMENTS: ALEXANDER'S OPERATION.—For the cure of retrodisplacement of the uterus some prefer Alexander's operation, or shortening of the round ligaments. This consists in exposing the ligaments in their sheaths in the inguinal region, drawing them out, and sewing them into the peritoneal and subperitoneal tissue. By this means the fundus of the uterus is brought forward and maintained in that position. The peritoneal cavity is unopened, and, under antiseptic precautions, the operation is not attended with danger.

In ill-developed women, or those whose muscular tissues have been rendered weak and anæmic, the round ligaments share in the general muscular atrophy, and are insufficient to effect the necessary correction in the position of the womb. While this operation is applicable in some cases, ventro-suspension will be found advantageous in the greater number.

VAGINAL FIXATION OF THE WOMB.—By this method the uterus is brought forward against the anterior wall of the vagina, and the effort is made to retain it in an anteverted position by uniting the tissue at the lower uterine segment with the subvaginal tissue. While this operation may be temporarily successful, it leaves the patient in bad condition for pregnancy, and should not, as a rule, be employed.

Pregnancy in Cases Operated upon for Displacements.—Abundant experience shows that in operating for displacements of the womb the operator should avoid the formation of a large and firmly-adherent surface between the uterus and adjacent viscera. In ventro-suspension the peritoneal ligament which forms is the desirable factor in the case. In the shortening of the round ligaments these tissues maintain the uterus in anterior position. The greatest objection to vaginal fixation arises from the fact that it leaves the uterus in a condition where it cannot rise freely from the pelvic cavity. All operations for displacement of the womb should be avoided, if possible, in women who are in the child-bearing period of life. If lacerations be properly closed and careful attention given to the general strength and muscular condition of the patient, such operations are very rarely necessary.

PART V.

INFANCY.

SECTION I.

THE PHYSIOLOGY OF INFANCY.

CHAPTER I.

THE NORMAL INFANT.

Weight and Development.—The weight of the fœtus at term is from 6½ pounds for girls to 7½ pounds for boys. Children have been born weighing as much as 22 pounds, while at the other extreme of the scale children have lived who weighed but 2¾ pounds.

The circumstances determining the relative development of the fœtus are the size and stature of the parents, and especially that of the father. The general condition of the mother and her nutrition are also of great importance in determining that of the fœtus.

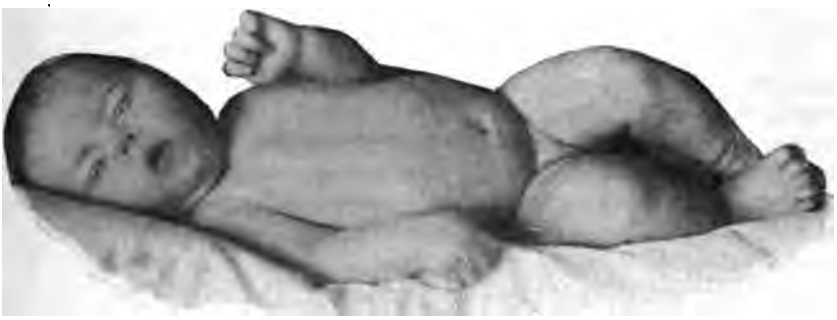
At birth the fully-formed fœtus has certain definite proportions, which are a valuable index in determining its maturity and normal growth. The length of the child is commonly estimated at 50 cm. If half this length be taken and ten added to it, the sum (35 cm.) is the circumference of the chest. In the normal new-born child the greatest circumference of the skull exceeds that of the thorax by 2 cm. When this proportion is altered or reversed the fœtus is the subject of some vice of development, as is seen in the rhachitic or in hydrocephalus. The healthy infant loses weight for the first few days after birth, but by the end of the first week the loss of weight ceases and the child begins to grow. This gain is in direct proportion to the quality of its food and the perfection of its assimilation. Usually several ounces are gained each week, and the rate of increase is a steady one for the first year of life.

Viability.—It is important at times to diagnosticate the stage of development of a given fœtus. Medical and legal questions sometimes require an opinion regarding the maturity or non-maturity of a given child. It has been asserted that the size of the finger- and toe-nails, the ability of the child to open its eyes, the presence of hair upon the scalp and of the lanugo on the skin are important evidences that the child is at full term. While these points are essential in establishing viability, they are not proof that the infant is fully matured. A better proof that the child is fully grown is found in its weight and in its various dimensions. In the fully-formed infant the accessory fontanelles are closed; the smaller fontanelle is nearly obliterated; the larger fontanelle is only sufficiently large to contain the thumb or largest finger; the eyes are fully opened and bright, and the child is able to nurse vigorously. In the male infant the testes are found descended into the scrotum. The fully-formed child can cry lustily, while its functions of digestion and excretion are well performed.

If the child falls considerably below the normal weight and proportions, although it may live, it must be considered as an ill-developed child, although viable.

Respiration.—The first movement of infant life consists in the act of respiration. This may occur during or after birth, and is occasioned by pressure upon the umbilical cord, or by the occlusion of the placental sinuses and the cessation of pulsation in the bloodvessels of the cord. Respiratory acts which occur during birth are dangerous to the child, on account of its liability to inspire mucus or blood from the mother's genital tract, thus setting up inspiration-pneumonia. When respiration occurs outside the mother's body, it marks a natural transference from life dependent upon the mother to a separate existence. As soon as the child is born, its mouth and nose having been cleaned, it should be laid upon its right side, with its head slightly lower than its body. The cord should be taken in the fingers of the physician and its pulsations noted. As soon as this ceases or becomes faint the cord should be ligated in two places, and cut between the ligatures. If the child's mouth seems partially occluded, it should be held head downward for a few moments, when it will expel mucus or blood from the mouth and nose. A healthy infant will often cry lustily for a few moments after birth. Various explanations have been given for this cry, and it seems most reasonable to conclude that irritation of the skin, caused by the cooler air, creates an involuntary inspiration and expiration.

FIG. 260.



Healthy infant.

Changes in the Circulation.—The changes in the infant's circulation which occur after the ligation of the cord, as well as the expansion of its lungs, take place very gradually. The blood gradually ceases to pass through the foramen ovale, while the bloodvessels from the umbilicus gradually close. The lungs are not fully unfolded and filled with blood for some time after the child is expelled. During this time the child's need for air is much less than afterward. The fear often expressed that an infant will smother because its head and face are covered with flannel thrown lightly over it is unfounded. At birth the child's blood contains an excess of oxygen, sufficient to carry on its vital processes for some time with but partial respiration.

The First Bath.—It is a good practice to wrap the new-born child lightly in a warm but light woolen blanket, after thoroughly anointing it with sterile olive oil. The child may then be laid in a convenient place upon its right side until the time of its first bath. Bathing with soap and water must be considered as an unnatural process in infant life. No other animal but the human species subjects its young to the exposure of total immersion in water at so early a period.

There can be no question that weak infants are often seriously endangered by bathing, from the withdrawal of heat from the body and the depression which follows such a process. In order that an infant's bath may be safely given, the child and its bather must be protected from draft. The bather must sit near a source of heat, of which the best is an open coal or wood fire, while the worst is the register from a furnace flue. In summer weather no external heat save that of the sun is usually needed, but drafts must be avoided during the bath, and on damp days an open wood fire is most beneficial. It is quite sufficient, for purposes of cleanliness, to bathe the infant without immersing it in a tub of water. To cleanse the child none but the finest substances should be employed, while two basins of water are required. The child's head and face are to be bathed with a separate sponge, from a separate basin from those employed for the remainder of its body. The reasons for this precaution are to avoid the transference of infectious matter to the child's eyes and mouth, or from the region of the umbilicus or genitals. The water to be employed should preferably have been boiled, and should be taken at a temperature of not less than 100° F. The bather should wear a large, soft, flannel apron, sufficiently capacious to furnish ample covering for the body of the child. The child's head and face should first be bathed, the eyes being carefully cleansed with boric acid solution, small bits of old, soft, and sterile linen being used for this purpose. The mouth should also be cleansed in like manner, and the nostrils if there be any discharge from them. None but the purest and mildest soap may be used for an infant, and the entire scalp should be thoroughly cleansed with soap and water. When the toilet of the face and head is completed, the washing of the body should be done with a separate sponge from a separate basin. The child should be rapidly but thoroughly washed and rubbed, especial care being taken to cleanse the genital region thoroughly. The child's body may be anointed with a simple, sterile fat to advantage, pure olive oil or cocoa butter being useful.

Some prefer the use of various powders, of which powdered boric acid, powdered oxide of zinc, and talcum powder are most used.

The Umbilicus.—The care of the infant's umbilicus is a matter of importance, because infection may enter at this point, and because hernia may form where the umbilicus is imperfectly healed. When the child is first bathed, the nurse or physician should carefully examine the cord to be sure that no bleeding is going on. Where an abundance of Wharton's jelly is present, the cord may be cut again above the ligature, and the cord squeezed out from the umbilicus between the thumb and finger; it should then be retied firmly and smoothly. The cord and the navel should be thoroughly cleansed with boric acid or bichloride solution, 1 : 5,000, and the stump of cord freely powdered. An unirritating powder, such as salicylic acid, one part, and powdered starch, five parts, forms a useful combination for this purpose. The stump of cord should then be wrapped in borated cotton and laid upward, to the left of the umbilicus, and kept in place by a light binder. The cord gradually dries without suppuration, and usually separates in from five to ten days. If scrupulous cleanliness be observed, germs will not gain access, nor will inflammation occur about the umbilicus.

Clothing.—The clothing of the new-born infant is a matter of importance. The best baby clothes are those which are of soft material, plainly and simply made, and so arranged that the child can be quickly and easily dressed. The abdominal binder may be of thin flannel, but is best when made from worsted, being knit without a seam. Its purpose is to keep the dressing upon the cord in place and to prevent injury to the umbilicus by the movements of the child. Infants should wear woolen next to the skin throughout the entire year. The weight of these clothes must be changed in accordance with the temperature of the external air.

Next to the skin of the child should be worn a woolen undershirt, so arranged that its lower edge may be attached by buttons to a woolen slip or skirt. Over these a long, white slip may be placed, being put on over the woolen, and both being placed upon the child by the same manipulation. The child's diaper should be of soft absorptive material, which does not occasion inconvenient bulk between the limbs. It is very desirable that some diaper material be found which can be destroyed as soon as soiled. Until this is prepared, the child should have an abundance which should be washed and dried as soon as soiled. The practice of simply drying the child's diapers without washing them is always dirty.

The child's feet should be covered with knitted socks, while its shirt should have sleeves coming to the wrists. A well-dressed infant has the smallest number of articles required, of the finest texture and simplest pattern. But one pin should be used in the child's dress, and that is its diaper pin. Buttons and strings should be employed for fastening its clothing. In addition to this clothing, the child will need woolen wrappers and woolen robes, to be used when it is taken through the halls of the house or out of doors. It will also require a suitable cap. Elaborate infant's wardrobes, composed of garments complex in pattern and heavily and expensively trimmed, are an annoyance to the child and an instance of bad taste on the part of the parents.

Nursing.—As soon as the mother has awakened from her first nap the child should be put to the breast. Before this, if the infant is restless and hungry, it should be given a teaspoonful of sterile water as often as desired. So simple a thing as first putting the child to the breast may be done properly or in a way to cause annoyance and disappointment to mother and child. The breasts should be prepared by cleansing the nipple with boric acid solution, and by gently drawing it out with an antiseptic thumb and finger. The mother should then recline in such a posture that the nipple will fall naturally into the child's mouth, while the infant is held upon her arm. The first effort of the child to nurse may cause the mother considerable discomfort, but this will soon pass away. As the nipple becomes drawn out the secretion of milk increases. The child should be allowed to nurse at first as long as it will, and should be given the breasts in alternation. After nursing, the nipple is to be cleansed and also the mouth of the child, and the child should be put quietly to sleep. A healthy newborn infant will pass the greater part of its time for the first days in sleeping, and this repose should not be interfered with by meddlesome relatives. The child will pass urine freely from the first hours of its life, and if the mother's breast contains colostrum, the bowels will move in the first eight or ten hours after delivery. The first urine of the child is almost colorless and abundant in quantity. The first bowel movements are tarry, with an odor resembling burnt molasses. They resemble the juice of poppy in its crude state—meconium. They are composed of disintegrated blood corpuscles, the hæmatin of which largely gives them their color of bile; epithelial cells and mucus from the intestines. They gradually become light as the secretion of milk is established, until the stools are yellow, resembling boiled corn meal. It must be remembered that the new-born child needs an abundance of water to flush out the kidneys and stimulate the action of the bowels. This should be given in teaspoonfuls as often as the child will take it. The child should nurse at regular intervals, and its daily life be established from the beginning with absolute regularity.

Nutrition and Nervous System.—The nutrition and growth of the infant are profoundly influenced by other factors than food and sleep. After its bath the child should be gently but thoroughly rubbed, and its muscles gradually developed by very light massage. If the hands of the nurse be anointed with olive oil or cocoa butter, the skin of the infant will remain soft and uninjured. Although the eyes of the child cannot bear a bright light, still it should be kept in a well-lighted and sunny room. The light must not fall directly upon the child's face, but the influence of light upon growth is positive, and should not be omitted.

It should be remembered that the new-born child has an exceedingly sensitive nervous system, which receives a multitude of impressions from the world outside and is gradually developed by them. There is no evidence that the new-born infant possesses a mind or that it has mental consciousness of the world about it. It is, therefore, useless to receive its sounds or evidences of appetite as coming from an intelligent being. The development of the brain is a gradual process, and the relations of the child to life are of a purely animal nature. The new-born infant will be healthy and contented in proportion as it is treated as a growing animal. Its wants should be supplied with scrupulous regularity and cleanliness. If it be kept warm and comfortable and fed, it requires and cares for nothing more. It is folly to disturb it by making it a plaything for others or to ascribe to it intelligence which it does not possess.

CHAPTER II.

ARTIFICIAL FEEDING.

Indications.—Artificial feeding of the new-born is often a necessity through failure of the maternal supply of food. It may be necessary to feed a child artificially because the mother's milk is deficient in quantity or abnormal in quality, or because the child makes drafts upon the mother's strength which her health will not permit. Cases are sometimes seen in which the milk is slow in forming in the breasts, and in which it is necessary to nourish the child artificially until lactation is established.

In cases where the establishment of milk secretion is delayed, the best results will be obtained by selecting a suitable combination of cow's milk to take the place of mother's milk. As cow's milk is less digestible than that of the mother, from its excess of casein and deficient fat, it must be modified. If the child has difficulty in digesting milk so diluted, barley water or oatmeal water may be substituted for the water used to dilute the milk. Milk thus diluted may be given to an infant of normal size and development without the use of digestive ferments.

Analyses of Milk.—The most rational basis for the preparation of infant's milk is found in chemical analysis of mothers' and cow's milk. The following are given by Rotch as taken from a normal woman and a sound cow:

Breast-milk.	
Fat	4
Sugar	7
Proteids	1.50
Ash	0.15
Total solids	12.65
Water	87.35
	100

Cow's milk.	
Fat	4.04
Sugar	4.55
Proteids	4.15
Ash	0.71
Total solids	13.45
Water	86.55
	100

Prescription of Milk.—For convenience and accuracy in prescribing it is well to retain percentages to designate the composition of a given food. This is readily done in sending to a milk laboratory, but in domestic practice the physician must retain ounces or tablespoons as units of measure. The following illustrates a milk laboratory prescription for an infant ten days old:

THE WALKER-GORDON LABORATORY.

	Per cent.
Fat	2.
Milk-sugar	6.
Albuminoids	.06
Mineral matter	0.15

Remarks.	
Number of feedings	10
Amount of each feeding	℥ 2
Infant's age (days)	10
Infant's weight	..
Alkalinity	5 per ct.
Heat (6 minutes)	167° F.

If cream obtained by skimming is used, the following formula has been found useful by Morse and others:

Upper one-quarter of milk set for cream	4	ounces.
Lime water	1	ounce.
Water	15	ounces.
Milk-sugar	6¾	drachms.

For a child two weeks old.

Starr advises, for the artificial feeding of an infant from birth to seven months, the following:

Age.	Cream.	Whey.	Milk.	Milk-sugar.	Salt	Water.	Hours for feeding.	Intervals of feeding.	Total quantity.
During 1st week	f℥ij	f℥iij	....	gr. xx	.....	f℥iij	5 A.M. to 11 P.M.; sometimes 1 A.M. and 3 A.M.	2 hours	f℥xij
From 2d to 6th week	f℥ij	...	f℥ss	gr. xx	a pinch	f℥j	5 A.M. to 11 P.M.	2 hours	f℥xvij
From 6th week to end of 2d month	f℥ss	...	f℥x	ʒss	a pinch	f℥x	5 A.M. to 11 P.M.	2 hours	f℥xxx
From 3d to 6th month	f℥ss	...	f℥ij	ʒj	a pinch	f℥iss	5 A.M. to 10.30 P.M.	2½ hrs.	f℥xxxij
During 6th and 7th months ...	f℥ss	...	f℥iijss	ʒj	a pinch	f℥ij	7 A.M. to 10 P.M.	3 hours	f℥xxxvj

Quantity.—Recalling the capacity of a child's stomach, it must be remembered that an ounce is quite sufficient during the first few days of life, and that after that two ounces at a feeding will suffice for the first week or two. It is best to employ the nursing bottle, as the child takes most kindly to this form of substitute for the mother's breast.

Mixed Feeding.—In delicate women a secretion of milk, although abundant for the first month or two after the birth of the child, may become greatly reduced after the mother assumes her usual duties. This is a plain indication to relieve her of the tax upon her strength by partially feeding the infant. The mother may retain her milk by nursing the child several times daily. It is well to give the child the bottle at first once daily in the forenoon, and afterward at morning and afternoon, and finally allowing the child to nurse only at night and morning. This plan has the further advantage that, should the mother become ill, the child is already accustomed to artificial food, while, on the other hand, if the child becomes ill, the mother will still have sufficient for its enfeebled power of digestion.

Hygiene of the Dairy.—The bacteriological examination of an ordinary sample of cow's milk reveals the presence of numerous bacteria and of considerable quantities of foreign matter, some of which is partially decomposed organic material brought from dirty dairies. The study of enteritis in children has informed us of the fact that these disorders are caused by the presence of bacteria such as are found in milk. The natural application to be made from these facts lies in the effort to procure for infant feeding aseptic or pure milk, or, failing in this, to render milk sterile before giving it to children. Further investigation by Leeds has shown that prolonged sterilization by heat destroys the digestive properties of milk, and robs it of much of its nutritive value. In view of these facts, it is most desirable to obtain aseptic milk for infant feeding rather than to sterilize milk by the application of heat.

The first step in securing pure milk lies in the selection of proper herds and in the maintenance of proper hygiene for cattle, with accurate cleanliness in dairies. In choosing cows to furnish milk for infants, finely-bred animals, producing large quantities of cream, should be avoided. The average pasture cow, sound and free from disease, is preferable. The child should not be limited to the milk of a single cow, but mixed milk from several animals should be chosen. Tubercular infection is sufficiently common among cows to render the application of the tuberculin test advisable in dairy herds. Cows kept for such purposes should have carefully-selected pasture, and should be fed under intelligent supervision. A plentiful supply of pure water must also be available for them. Care should be taken that cows which have suffered abortion should not be used for dairy purposes until they have thoroughly recovered. It has occasionally been observed that animals suffering from retained placenta, with septic infection, have been found in herds from which milk was taken for infant feeding. It can scarcely be wondered at that pus and bacteria from such animals have been found in their milk.

The stables in which dairy cows are kept must be scrupulously clean. The animals should not be permitted to stand upon decomposing bedding and feces, and care should be taken that ventilation is abundant and that sunlight finds free access to the stable. The floor should be frequently washed, and haylofts should be thoroughly dry and well aired. The animals themselves must be kept clean, and it is often advantageous to groom them to prevent hairs from falling into the milk. Before milking, the teats of the animal should be thoroughly washed with soap and water, and with boric acid solution. When the animal is milked, care should be taken that the cow stands upon a clean surface which will not yield dust when the animal stamps or moves about. Precautions must also be observed that the cow does not soil the milk with particles of manure transferred by the tail. It is important that the milker should be cleanly dressed in material which can be washed, and that his hands should be aseptic. The milk should be received into vessels which have been scalded, cooled as rapidly as possible, and strained through sterile gauze into clean glass jars, and immediately sealed and sent to the consumer. It is also well to affix to each jar a label, giving the time at which the milk was taken and the name of the person who milked. Milk so furnished is practically sterile, and needs no sterilization at high temperature.

Separator Cream.—It has been found that, to obtain an accurate amount of fat from milk, it is more advantageous to employ centrifugal force than to rely upon the rising of cream. Centrifugal cream may be reckoned at from 16 to 20 per cent. fat, and thus used in preparing infant's food. The advantages of such fat are its freedom from bacteria and from some of the fat acids which are often present in cream as ordinarily obtained. Separator cream is also much cleaner than cream obtained by the ordinary rising of milk, because dirty and extraneous matters commonly contained in milk are mechanically removed by the process of separation. Such cream is often found to be practically aseptic and sterile.

Care of Apparatus for Artificial Feeding.—The apparatus employed to convey milk to the child must be kept thoroughly aseptic. Nursing bottles made with rounded corners and without crevices are to be chosen. Pure-gum nipples of black rubber, and large enough to be turned inside out and cleaned, are best. Under no circumstances is a bottle with a nipple and tube to be chosen. The articles required to prepare milk properly for an infant are a half-dozen nursing bottles, a glass measure to contain two or three ounces, and graduated; a glass funnel, litmus paper, a dozen nipples, a brush for cleansing the bottles, and aseptic or borated cotton. A sterilizer is convenient, but not at all indispensable. Milk sugar should also be in readiness. An alkaline solution, either lime water or bicarbonate of sodium in solution, may be employed, or a given quantity of soda may be added to each bottle. Bottles must be cleansed by boiling with the free use of soap and hot water, and frequent rinsing in hot soda solution. The brush must also be used, should curded milk adhere to the bottle. When not in use, the bottles may be kept filled with boric acid solution or with solution of soda. The rubber nipples are to be thoroughly washed in soap and hot water, well rinsed, and kept, when not in use, in boric acid solution.

Pasteurization.—Investigation has shown that unless one is positively informed regarding the circumstances under which the milk was produced and furnished, that it is the part of wisdom to destroy noxious bacteria which may be present. This may be done by heating the milk to 167° F. for six minutes; such a process is known as Pasteurization. It is difficult, however, to obtain an exact measurement of temperature in milk without apparatus constructed for the purpose. It is found that, practically, the temperature desired is obtained by scalding milk for ten minutes. This may be readily accomplished as follows: The desired number of bottles are filled with the mixture of milk to be taken. The bottles are then corked with aseptic cotton. They are placed in a vessel containing water sufficient to cover three-fourths of each bottle. The vessel is then subjected to heat, the water surrounding the bottles allowed to boil, and the milk allowed to simmer for ten minutes. The bottles are then placed upon ice until required. When it is desired to use the milk it is again heated to blood heat in water, the cotton plug is removed, and the rubber nipple slipped over the neck of the bottle. Milk thus treated will remain in good condition for twenty-four hours, and, if kept cold, for a longer time. It has been shown that this process does not lessen the nutritive value or digestibility of the milk.

Sterilization.—Milk has been subjected to 212° F. for twenty minutes and half an hour to render it sterile. It is quite possible to destroy bacteria by this process, but the milk is rendered indigestible and not nutritious. Others prefer to sterilize milk at a lower temperature, and while this process is less objectionable, it renders the milk less easily digested. In many instances milk is disintegrated by sterilizing at high temperature, the fat forming in lumps, while the casein and fluid portion of the milk remain unchanged.

Milk Laboratories.—Where the advantages of milk laboratories are at hand, milk may be modified and prepared by the direct prescription from the physician. The process of modification consists in separating the fat by centrifugal force, and in adding it to the milk consumed in the proportion desired. The exact degree of dilution necessary is also readily obtained. An alkaline reaction is secured, and the milk is sweetened with milk sugar. Any method of sterilization desired is employed, and the milk is given to the consumer as a physician's prescription is furnished to his patient by an apothecary. Such opportunities, however, are not afforded to all, and for practical purposes each mother or nurse must conduct her own laboratory. If the physician be intelligent in the matter and prescribes accurately the composition and quantity of food to be taken, the practical difficulties in the way of preparation can usually be overcome.

Variation in Quantity and Quality.—It is a matter of importance to know upon what indications the quantity of food given to an infant is to be increased or diminished. Children vary in digestive power and appetite and rate of development, so that no fixed rule can be assigned for all. To a healthy, robust infant not more than an ounce of mixture containing milk should be given at a feeding for the first week of life. This quantity may be gradually increased as the child's appetite and digestive power improve. An indication for increasing the food of an infant is its manifest hunger, its stationary weight, and the normal character of its stools. Indications for lessening the amount of food are its rejection or refusal by the child, the presence of undigested curd in the stools, failure to increase in weight, loss of appetite, restlessness, and colic.

It is a question often raised as to whether the composition of the child's food should remain the same as it grows older, or whether the amount of solid matter and the quantity taken should be increased. Some allege that it is irrational to increase the amount of solids, because the composition of mother's milk remains essentially the same up to the time of weaning. Others regard mother's milk as changing frequently under varying circumstances in the amount of solids contained, and prefer to increase the quantity in the milk taken by the child as it develops. The latter undoubtedly gives the better results in practise. The original dilution may be retained with advantage as long as the child thrives for the first few months of life. The amount of water used in each bottle should then be lessened as the child's digestion will permit.

Mixed Diet.—Indications for enlarging the diet of the child are found in the appearance of teeth. As soon as they are perfectly developed the child may begin gradually to obtain a small amount of starch or fatty food by the use of its teeth. This is best accomplished by allowing the child to gnaw upon a cracker which has been softened by milk or water, and to give it a chop bone or chicken bone from which it may derive a small amount of fat. The child will not, however, perform mastication properly until the first teeth are complete.

The intervals of feeding must be gradually lengthened, care being taken that the arrangement of the child's feeding gradually approaches the meal times of adult life. Artificially-fed infants suffer not infrequently from diarrhœa or obstinate constipation. In the absence of an acute attack of diarrhœa, it is usually sufficient to dilute the food and to add to it barley water.

Diarrhœa.—In other children the appearance of diarrhœa demands the entire withdrawal of milk, and feeding upon beef juice, broth, or egg albumin with barley water.

Egg albumin is best prepared by beating up the white of a raw egg in eight ounces of water, and adding to the eight ounces enough salt or sugar of milk to give a faint taste. Barley water is prepared by boiling a half-teacupful of barley grains in a quart of water until the grains are thoroughly disintegrated, and then straining the resultant fluid.

Feeding in the Later Months.—Many children relish their food better if salt is added, and the quantity usually put into a nursing bottle is what is commonly termed "a pinch of salt;" this corresponds practically to a half-teaspoonful. If it is necessary to render the action of the bottle alkaline, bicarbonate of sodium may be employed in place of salt, ten grains to eight ounces. Others prefer to substitute one ounce of lime water for one ounce of water. After the first three months of life the formula may be:

Milk	℥2.
Cream	3.
Lime water	1.
Water	2.

Sugar of milk 1 teaspoonful.
To make eight ounces.

This may be continued until the sixth month is reached, when the formula may be:

Milk	℥2½.
Cream	3½.
Lime water	1.

And water to make 8 ounces, with sugar of milk as before.

This formula will be found sufficient until the child has cut its first teeth at the eighth or ninth month. From this time the formula may be:

Milk	℥3.
Cream	4.
Lime water	1.

Sugar of milk 1 teaspoonful.

Many children do well by the addition of dry extract of malt to the milk and cream in the following formula:

Milk	℥3.
Cream	4.
Lime water	1.

Extract of malt 2 teaspoonfuls.

If this agrees well with the child, the amount may be gradually increased to one-half ounce. Such a combination is very fattening with some children, and tends to relieve constipation.

The amount which a child may take should not be over one ounce at a time for the first week or ten days of life, two ounces for the second ten days of life, and three for the third. An observant mother or nurse can by this time arrive at an intelligent idea of the natural appetite of the child, which should be gratified as long as digestion is good.

Intervals of feeding should be at first every two hours for the first twenty days, and from then until the sixth month every three hours will usually be a convenient interval. After the sixth month every four hours is usually often enough, while at the eighth month every six hours will usually suffice, if the child has a good appetite for each meal.

Constipation.—Constipation is often observed in infants, and is an exceedingly disagreeable and, at times, injurious complication. It frequently results from the fact that the child obtains but an insufficient amount of water. In other cases the meconium persists after birth, and the functions of digestion are slowly established. Where the child is obstinately constipated, it is well to employ oatmeal water in place of that used in diluting the milk. The addition to milk of dry extract of malt proves efficacious in many cases.

Oatmeal should be used in the form of dilute gruel, and this is to be made by thoroughly boiling a coffee-cupful of oatmeal in a pint of water, straining it through coarse cheesecloth, and sweetening it with milk sugar. Extract of malt may be used in place of oatmeal, by adding to each eight ounces of the child's food from one-half of an ounce to an ounce.

Massage of the abdomen, pressure being made along the large intestine, is often of value. The wearing of an abdominal binder of flannel is also useful in many cases. Five grains of sodium phosphate may be added to an eight-ounce bottle of milk and cream, and its use continued for several weeks. Aromatic cascara sagrada is of service in these cases, a dose for a child one month old being ten drops night and morning, and, if necessary, twenty drops night and morning until a decided effect is produced. When this results, the dose may be lessened until it is ascertained what is actually required.

Observation will often determine which constituent of the food is in excess or deficient, and when this is remedied digestion is better performed. In many cases olive oil may be taken to advantage, from one-half a teaspoonful to one or two taken daily or several times a day. As soon as the child is old enough to leave an exclusively milk diet broths and soups may be prepared, the stock of which contains the extractive matter of various vegetables. Orange juice in season is often useful in these cases. The juice of stewed prunes, apple sauce, change of air from the city to the country, will sometimes cure this distressing complication.

When the bowels refuse to act in an infant, care must be taken that the lower bowel is emptied mechanically at frequent intervals. One of the least harmful of these measures consists in the injection of warmed olive oil into the rectum. Soap suppositories and gluten suppositories are often valuable in these cases. Injection of glycerine is too irritating for infants as a rule. Injections of tepid or cold water, with or without soapsuds, are indicated in many cases, and will often assist in removing a condition of jaundice. As children obtain teeth, whole wheat bread soaked in milk or broth, grated or stewed apple, or oatmeal gruel or fine hominy are useful in these cases. It is especially important that the nurse who has charge of the infant should practise massage of the intestine intelligently each morning. An obstinate habit of constipation may often be avoided in this way.

The influence of habit in avoiding constipation with children is very important. The child should be taught to make the effort to have its bowels moved at a regular time each day, and if it be placed upon a suitable vessel at that time it will soon learn to make the effort for itself. Such training may begin when the child is a few months old, and with well-developed children the rapid formation of a regular habit is often remarkable.

Weight at Regular Intervals.—Experience shows that the most reliable criterion in determining the healthful growth of an infant is found in its weight. Children should be weighed at regular intervals and a record kept. A normal gain for an artificially-fed child is one-half ounce daily. Nursing children are sometimes seen who gain several times this amount upon breast milk alone. Many influences may cause a temporary cessation in the child's gain in weight. Extremes of heat and cold, marked changes in the weather, irritation from the teeth or from any other portion of the body, slight intercurrent affections, as a slight bronchial catarrh, may all interfere for a short time with the child's gain in weight. Under these circumstances, however, the child should not lose. A temporary cessation of gain must not be considered as a valid indication for making a considerable alteration in the quality or quantity of the child's food. When, however, the child loses weight, changes are necessary in the quality or quantity of its food or in the method of its administration.

Most Common Errors in Artificial Feeding.—A desire to rapidly increase the weight of the child by giving it food containing a percentage of proteid matter too great for its digestion is probably the most common error in artificial feeding. The importunity of mothers and nurses that a child be fed improperly, in order that it may be fat, and their belief that its food is too weak, may lead the physician, against his better judgment, to errors in prescribing its diet. It must be remembered that it is not what the child takes, but what it assimilates, which does it good. When once the child's digestive power has been accurately gauged, a rational basis has been obtained, from which increase in its diet may proceed. In altering the constitution of the child's milk, the fat may be increased if the child has a tendency to constipation, but is otherwise well. The proteid element should be the last ingredient given in larger quantity.

For slight and temporary derangements of digestion, an alteration in the child's food may be avoided by giving the child water just before it receives its bottle. The child thus dilutes its food, and its lessened appetite results in the taking of less food and of a mild dilute character. While a change in the child's diet becomes imperative in the presence of prolonged indigestion or loss in weight, the mistake must not be made of changing for each slight and temporary variation in the general health.

SECTION II.

THE PATHOLOGY OF INFANCY.

CHAPTER III.

ASPHYXIA.

By the term "asphyxia," when applied to adults, is understood a deprivation of the individual from his usual supply of oxygen needed to maintain life. The most familiar examples of asphyxia are afforded in the cases of drowning and poisoning by coal gas. A patient may die from asphyxia from his own tissues, when the nervous system is so paralyzed that respiration ceases. Such is the case in opium poisoning. Again, mechanical compression of the windpipe or occlusion of the mouth will result in asphyxia.

The fœtus is liable to asphyxia while within the uterus and after birth. It will be remembered that during intrauterine life the placenta acts as does the gill of the fish, conveying oxygenated blood into contact with the fœtal circulation. It is evident that any cause which interferes with the mechanism of intrauterine circulation between the fœtus and mother will deprive the fœtus of oxygenated blood, and hence produce asphyxia. The process of birth affords excellent opportunity for such a complication, by reason of the pressure to which the child and its cord are then subjected.

When the child emerges into the atmosphere it is evident that occlusion of its respiratory passages, or paralysis of those muscles which perform the respiratory act, may bring about a condition of asphyxia.

Livid and Pallid Asphyxia.—Clinically speaking, asphyxia is commonly seen in two degrees—in one, the milder form, the child does not breathe, while its heart beats slowly and heavily, and the surface of the body is blue from the unoxygenated blood. Muscular contractility is present, and the child is readily brought to respire. In the more advanced stages of asphyxia paralysis of the muscular system is present, the surface of the body is pallid, circulation is rapidly ceasing, while the child can be resuscitated only by prolonged and vigorous efforts. The first is sometimes known as asphyxia livida, the second as asphyxia pallida.

Etiology.—Asphyxia occurring before birth usually follows pressure upon the umbilical cord from coiling or twisting about the fœtal body. In cases where the cord is very short, occlusion may occur during the early stages of labor, and prove rapidly fatal. Separation of the placenta and hemorrhage also produce asphyxia, and are among its common causes. Disease of the placenta, which gradually alters its substance in such a manner as to destroy the lumen of its bloodvessels, gradually produces asphyxia. This is illustrated in nephritis and in arterio-sclerosis of the mother, where considerable areas of the placenta are destroyed by a process of white infarction. Syphilis of the placenta may accomplish asphyxia, not only by altering the substance of the placenta, but also by loosening it from the uterine wall through fatty degeneration of the decidua and endometrium. Direct violence separates the placenta and may rupture the umbilical vein, causing hemorrhage and death from asphyxia. Chronic poisoning may lead to such changes in the placenta as to cause asphyxia also.

Mechanism.—The course of intrauterine asphyxia cannot be understood without reference to the physiology of respiration, and especially to the part played in this phenomenon by the nervous system. The nervous centres of respiration are to be found in the medulla, apparently near the origin of the pneumogastric nerve. The accumulation in the blood of carbon dioxide acts as an irritant to the medulla, stimulating respiratory movements and also the inhibitory filaments of the pneumogastric nerve. When partial separation of the placenta occurs, or when the cord is so much occluded that but little oxygenated blood passes to the fœtus, the first effect is to cause respiratory movements and to slow the action of the heart. This has been observed by experiment upon pregnant animals, and has been confirmed by clinical observation. In cases where the mother has suffered violence, if the fœtal heart be listened to, it will be found that, independent of the mother's shock and without the presence of labor pains, if placental bleeding has occurred, the heart-sound of the fœtus will gradually become slower. If the placenta has been but partially separated, the child may rally, and its heart-beat gradually become normal in frequency and strength. It is interesting to observe that uterine contractions slow the fœtal heart-beat, undoubtedly by temporarily lessening the fœtal circulation and by temporarily depriving the fœtus of oxygenated blood. In practising auscultation the physician must remember this phenomenon, and avoid confusion through the presence of uterine contractions.

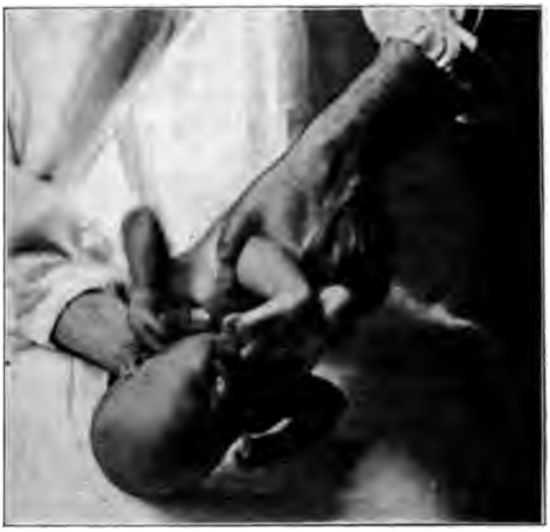
When the circulation of the fœtus is interfered with during labor, if air finds entrance to the genital tract, the respiratory movements of the fœtus may be accompanied by a faint sound known as an "intra-uterine cry." This may also occur within the cervix or vagina during labor. The fœtus cannot make inspiratory efforts, if its mouth be not occluded, without inspiring some of the contents of the fœtal sac. If the membranes be unruptured, the fœtus will inspire amniotic liquid and the contents of that fluid. If the membranes have ruptured and if the child has descended into the cervix or vagina, it will inspire not only amniotic liquid, but also blood and the secretions from the cervix and vagina. If these tissues are the seat of infection, the fœtus will naturally inspire infective germs and their products by this process.

Diagnosis and Treatment of Threatened Asphyxia.—When the physician, by auscultation, has recognized the alteration in the fœtal heart characteristic of asphyxia, his diagnosis will often be confirmed by the increased vigor and frequency of fœtal movements. These will resemble convulsions when this complication arises in vigorous children. The indications for treatment consist in terminating labor and emptying the uterus as soon as possible in the interests of the fœtus and the mother. If the birth-canal be partially dilated, this should be carried to completion, and the child extracted as rapidly as possible by version or the use of forceps. Where dilatation is not advanced the os may be incised by four cuts with angular scissors, and thus rapid opening of the womb be secured. Delivery should be completed as soon as the womb has been opened in this manner. Where the hemorrhage which threatens is jeopardizing the life of the mother, if it cannot be checked by tampons, by the rupture of the membranes, and by external manipulation, it will be justifiable to incise the abdomen and deliver the child and control the hemorrhage at once. If done promptly, such a procedure will be successful.

Where the fœtus is threatened with asphyxia through pressure upon the prolapsed cord, the replacement of the cord must be at once undertaken. This is best accomplished by carrying the operator's hand with the cord within the uterus, and placing the cord above the brim of the pelvis, and in such a position as to avoid pressure by the body of the child. If the conditions are favorable, labor may be terminated to advantage by version or by forceps. By placing the mother in a suitable posture, with the shoulders low and the hips elevated, the fœtus may be in some cases relieved of dangerous pressure. In cases where the umbilical cord is wound about the fœtus, delivery must be accomplished as soon as possible, and the cord hastily clamped between two hæmostatic forceps and promptly cut. It may be afterward ligated at the convenience of the physician.

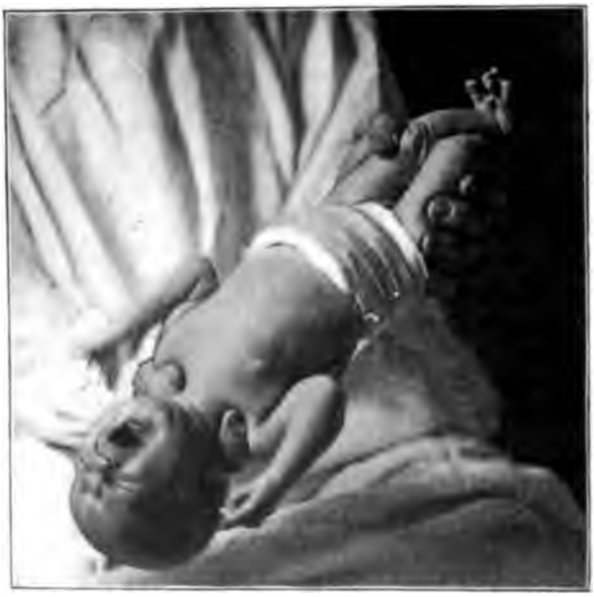
Treatment of Asphyxia.—Where the child is born in a condition of complete or partial asphyxia, it should be at once suspended by the ankles, while the physician takes the cord between his thumb and fingers to determine the presence or absence of pulsation. The attendant nurse should meantime thoroughly cleanse the mouth and nose of the child with the finger, covered by a bit of soft linen soaked in boric acid solution. If the cord be pulsating, haste is not imperative. By supporting the forehead of the child, the body being still suspended by the heels, the mouth will open, and mucus or other occluding substance will gravitate outward. As soon as the pulsation of the cord ceases it should be promptly tied, when the child will make respiratory movements. Should this not occur, the heart-beat of the child being strong but slow, and its surface suffused with blood, the cord should be allowed to bleed for a moment from its fœtal end. This will relieve a distended condition of the cavities of the

FIG. 261.



Resuscitating an Infant. Strong flexion of the trunk to promote expiration.
(From original photograph.)

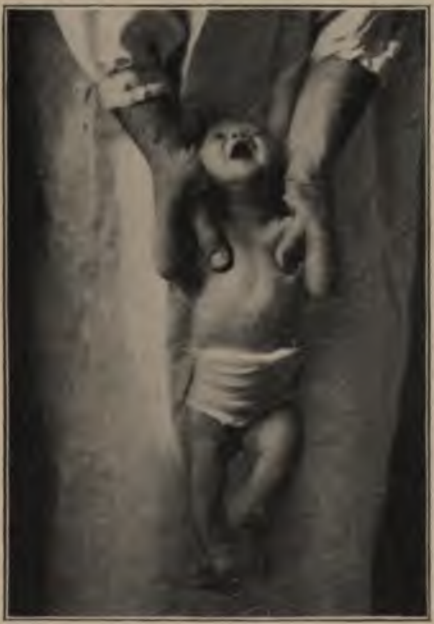
FIG 262.



Resuscitating an Infant; extending the trunk to promote inspiration.
(From original photograph.)

heart, and will favor the establishment of the pulmonary circulation. Where, however, this is not necessary, and respiratory movements do not occur as soon as the mouth has been thoroughly cleansed, the most simple and efficient method for treating asphyxia in the new-born consists in compression and relaxation of the thorax by folding and unfolding the child. Grasping the child with one hand by the thighs, just below the pelvis, the other supports the child by placing two fingers upon its shoulders, being held head downward. The child's body is then folded upon itself, the thighs being well up upon the abdomen, while the mouth remains open, with the head downward. By this manipulation pressure is made upon the abdominal contents, and the circulation of blood through the large vessels and viscera of the abdomen is promoted. The liver and other viscera are carried up against the diaphragm, the thoracic cavity is greatly lessened from below upward, and expiratory pressure is brought to bear upon the lungs. The heart is unquestionably influenced by the pressure of the abdominal viscera upon the diaphragm. It is possible that its chambers also undergo some compression. This manipulation requires one or two minutes to be efficient, and is followed by the complete unfolding of the child. Its back is being bent strongly, while the mouth remains open. By this second manœuvre the abdominal viscera descend, a partial vacuum is created in the respiratory pas-

FIG. 263.



Grasping the child for resuscitation by Schultze's method. (From original photograph.)

sages, air is thus invited to enter, and the circulation of the abdomen is again filled by the alteration in pressure and the distention of its vessels. This method serves a double purpose, that of introducing air into the respiratory organs and also a distinct promotion in the establishment of the circulation. It will be found that mucus often comes into the child's throat during this manipulation, although the child's mouth may have been carefully cleansed as soon as it was born. A hypodermatic injection of 1 : 100 grain of strychnia may be given to the child if the heart's action is weak, and a few drops of whiskey or brandy upon the finger may be introduced into the throat to stimulate its reflexes.

SCHULTZE'S METHOD.—This consists in grasping the child between the two hands of the physician, the thumbs being placed upon the chest, the index fingers in the axillæ, and the remaining fingers obliquely across the back. The head of the child should be thrown backward, being supported between the wide portions of the hands just above the thumbs. The child should then be raised and turned so that it will double upon itself, its feet and back coming toward the physician. It is then swung downward and outward, its lower extremities and abdomen falling downward toward the floor. By this manœuvre, when the child is swung toward the physician and doubled upon itself, the abdominal viscera are forced upward against the diaphragm, the chest is compressed, and a powerful expiratory action is obtained. When the child is swung outward and downward, the abdominal viscera fall away from the diaphragm, and a vigorous inspiratory action follows. There is abundant evidence to show that unless the mouth and trachea are completely occluded, air can be forced into the lungs by this expedient.

STIMULATION BY HEAT AND COLD.—It must be remembered that no manipulation for the relief of asphyxia can long be continued without danger that the child will lose heat and suffer from shock. After swinging the child several times it should be placed in a hot bath upon its back, the surface of the chest just below the water, and its tongue be drawn out, while the surface of the body is rubbed vigorously with the hand. If respiratory movements still fail, the child's body should be raised until the chest is above the water, and a spray or fine jet of cold water be directed against the region of the diaphragm. If the child's circulation is good, these procedures will usually establish respiration without difficulty.

SYLVESTER'S METHOD.—If, when the child is born, the cord is not pulsating, no time can be lost in delay, but the cord must be immediately cut and tied. The child should be held head downward while the mouth is thoroughly emptied and cleansed. Schultze's method should then be followed for a few moments until air has been forced into the chest. The child should then be placed in the warm bath and Sylvester's method of respiration be practised, while the tongue is drawn outward and forward. This consists in drawing the child's arms upward and outward, and then depressing them and bringing them across the chest. By this manœuvre the chest walls are made to perform their part in respiration, while pressure upon the diaphragm is made when the arms are brought forward, or may be aided by pressure exerted directly upon the upper portion of the abdomen. Cold water may be sprinkled or sprayed upon the child's chest, and, if its circulation be feeble, it may be given ether or strychnine by hypodermatic injection. If the circulation of the child is feeble, mustard should be added to the hot water and the child's limbs and back be vigorously rubbed. By keeping the child in the warm bath its circulation will be stimulated, and as long as its heart-beat and color improve there is hope for its recovery.

ASPIRATION AND INFLATION OF THE BRONCHIAL TUBES.—In cases where an abundance of mucus is found in the child's throat, and where it is evident that it has not been entirely removed by suspension and by swinging, a suitable catheter may be introduced within the trachea and aspiration of the bronchial tubes performed. A catheter to which is attached a hollow rubber ball is often used for this purpose, and is termed a balloon catheter. If such be not at hand, the physician may aspirate the bronchi by suction, and, when the child's lungs have been partially freed by this procedure, he may inflate them by blowing air into the bronchial tubes. This method, however, is less easy of accomplishment and less successful in the majority of cases than suspension, swinging, the use of the hot bath, and prolonged passive respiratory movements. The child's reflexes may be stimulated by dipping the finger in whiskey or brandy and placing it within the child's mouth. This will sometimes cause movements of deglutition and respiration. Favorable symptoms in asphyxiated infants are the maintenance of the heart-beat, the improvement in color, and gradual establishment of respiration. When, however, the heart cannot be made to beat, the color remains pallid, the child's body is completely flaccid, and its bodily temperature diminishes, it is evident that the case is hopeless.

Complications of Asphyxia.—A child may be partially asphyxiated and recover very slowly. Observation has shown that the infant's lungs are not completely inflated for several days after birth. When respiration is once established, these patients must be kept at a temperature of not less than 99° F. and their respiration carefully watched. Stimulants must be administered as the condition of the heart and the breathing indicate. Should respiration fail, passive respiratory movements must be instituted and kept up as long as needed. The use of the faradic current, one pole over the medulla and the other over the diaphragm, is of value in these cases. Rhythmical traction upon the tongue is indicated in cases where the breathing shows a tendency to become shallow and to cease.

Asphyxiated children are exposed to pneumonia by the inspiration of the contents of the birth-canal, and the exposure to which they are necessarily subjected during efforts to establish respiration. Inspiration-pneumonia, if it affects a considerable portion of the lungs, is generally fatal.

A striking symptom of inspiration-pneumonia, occurring in infants after prolonged and difficult labor, is rapid respiration immediately after birth. The respiratory rate may rise to 50, 60 or 70 in the minute. The pulse is correspondingly quick, although not so fast in proportion as the respiration. The temperature of the child is elevated to 101° or 102° F., the child is restless, and nurses poorly. The meconium is slow in passing away from the intestine, and the action of the kidneys is often delayed. On auscultation the child's breathing is excessively harsh, but râles can rarely be detected. The action of the heart and the rapid respiration are especially noticeable in these cases. Unless a marked improvement occurs in the first twenty-four hours after birth, the child usually fails and dies comatose.

The treatment of this condition is often unavailing. The child should be held head downward as soon as born, and should be put in this position at frequent intervals for the first five or six hours after birth. In this way inspired and infectious material will sometimes be expelled. The use of stimulants is indicated, brandy being given in two or three-drop doses at frequent intervals. Gentle counter-irritation over the chest may well be employed by a warm mustard bath, or by wrapping the child's chest in flannel wrung out of tepid water and sprinkled with spirits of turpentine. If the child nurses poorly, it may be fed by pumping the breast milk from the mother and dropping it into the child's mouth, or by passing a small, soft catheter connected with a funnel into the stomach. The majority of cases, however, of this complication end fatally, and are but little influenced by treatment.

Cerebral hemorrhage causes death in some cases of asphyxia. This may arise from pressure upon the cranium during birth, or from cerebral congestion.

Apnœa.—Asphyxia must be distinguished from apnœa in the new-born. In Cæsarean section it is not unusual for the child's respiration not to be fully established for some moments after birth. The heart action is good in these cases, the child's color is good, but respiratory movements do not occur. In these cases there is no necessity for respiration, and hence the delay. If the child is subjected to no pressure at the moment of birth, the cord remains unoccluded, oxygen passes freely from the mother's blood to that of the child, and the birth of the child by Cæsarean section is so rapid that its supply of oxygen is sufficient to continue its life for several moments after it leaves the mother's womb. In cases where the child has not been subjected to long birth pressure, there is no difficulty in the establishment of respiration.

A similar but less marked condition is often present after rapid easy labor. Here the child passes with so little pressure from the body of the mother that no interference with the circulation of the cord occurs, and the child lives upon the oxygen which its blood contains for some little time. As the child's lungs inflate gradually, it must be remembered that the child is not in a position to inspire vigorously at first, while provision has been made for its supply of oxygen in its blood corpuscles; hence, in caring for the new-born infant, especially if weak, warmth is more necessary at first than a free supply of atmospheric air. There is reason for the usage of experienced nurses, who wrap up the new-born infant so completely that it seems to bystanders that the question of respiration has been entirely neglected.

CHAPTER IV.

THE CARE OF THE PREMATURE INFANT: INCUBATION.

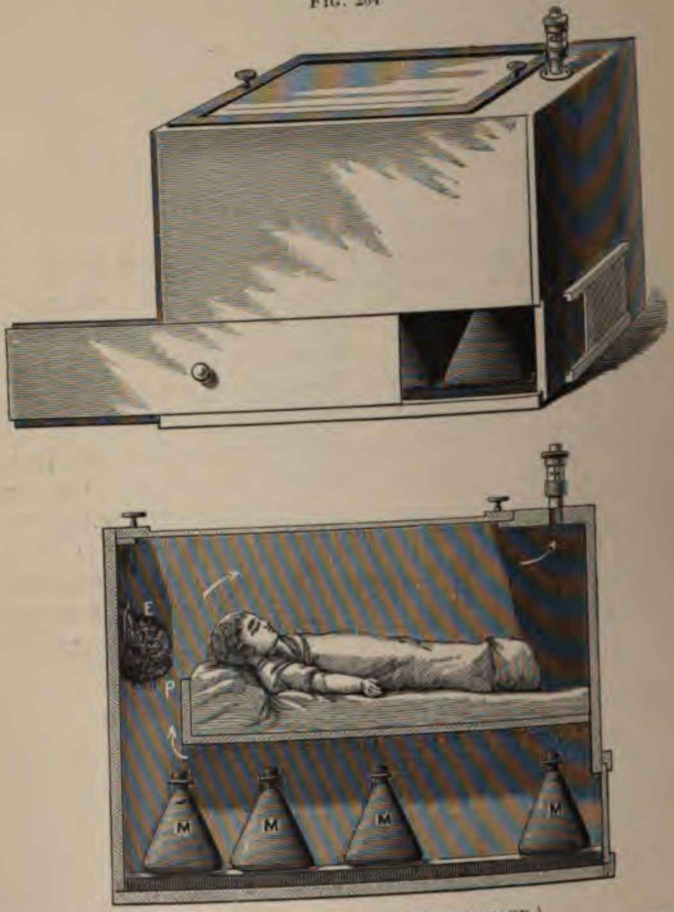
THE premature infant gives evidence of weakness by extreme susceptibility to cold, by feeble circulation, and undeveloped power of digestion. The temperature of the interior of the uterus is certainly as high or higher than that of the mother's body, and the change from this to the external atmosphere is very great. In the prematurely-born child closure of the foramen of the heart is not perfectly performed at first, the circulation is easily disturbed, and hence any serious condition may bring about cessation in cardiac functions. The digestive apparatus of the new-born infant is feebly developed, its stomach is undilated, and hence small quantities only of the most easily-digested food can be taken. After the birth of the premature child, when its heart-beat has been well established and its respiration is proceeding normally, the first indication is to supply the infant with an artificial temperature. This is best accomplished by incubation.

Incubation.—By incubation is understood the maintaining, for the infant, of an artificial temperature most closely resembling that of intrauterine life. It is evident that this is indicated in cases of prematurely-born children, or in those imperfectly developed. This method of treatment has a wide range of usefulness, not only in furthering the life and development of the weak infant, but also in treating many of the disorders to which infants are liable. In cases of broncho-pneumonia, in anæmia, and collapse following asphyxia or visceral hemorrhage, incubation will add greatly to the child's chances for recovery.

This procedure may be accomplished in one of two ways—either by so enveloping the child that it shall retain its own body heat, or by placing it in an artificially-heated atmosphere. Both are usually combined in cases of prematurely-born children. Where it is desired simply to preserve the body heat of the child, it should not be dressed in the usual manner, but enveloped in cotton or wool and bandaged loosely with wide cheesecloth or flannel bandages. The surface of the body should first be oiled, and the envelope may extend to the eyes and mouth. This can be so arranged that soiled material can be readily removed, and cleanliness thus maintained.

Apparatus.—Various sorts of apparatus have been designed for surrounding the new-born infant with an atmosphere of artificial heat. The simplest of these consists of a basket in which blankets are placed, and in which cans or heated bricks or flatirons may be employed as sources of heat. The child may be placed in such a basket and a loose blanket thrown lightly over it. More elaborate incubators consist of boxes with glass top, so arranged that a source of heat is supplied, while air gains entrance to the child. In the most elaborate forms of incubators an apparatus is also supplied for furnishing oxygen, and also for regulating the temperature to a very accurate and minute degree. While as objects of interest and scientific apparatus elaborate incubators may attract the attention of

FIG. 264

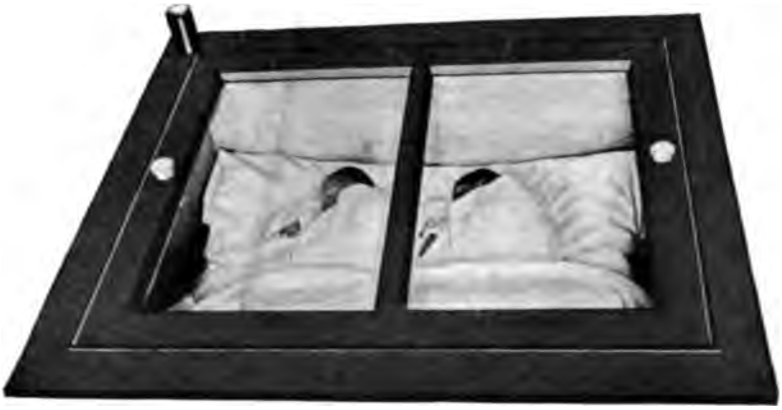


A simple incubator. (After AUVARD.)
M, hot-water cans. E, moist sponge. P, child's bed. A, arrows showing current of air.

the physician, for practical purposes they are inferior to the simpler forms of apparatus.

We have had excellent results in the use of a wooden box having a false bottom, upon which the child is placed. Heat is supplied by hot water, in tin cans made to extend the entire width of the box. Air gains entrance at the bottom of the box, is warmed by passing over the cans, circulates about the infant, and escapes through an escape pipe in the top of the box. A thermometer placed beneath the glass cover indicates the temperature within. It has been found by experience that if one can be replenished with water, not quite boiling, each hour, that a temperature of from 90° to 95° F. can be maintained. Among the most complete incubators is that of Tarnier, which has been greatly simplified by Auvard.

FIG. 265.



Large incubator with twins.

Feeding and General Care during Incubation.—In practising incubation it is essential that the child be disturbed as little as possible. It should not be removed to nurse, as feeble children are usually not sufficiently strong to suck. The milk should be pumped from the mother's breast, placed in a glass vessel surrounded by warm water, and dropped into the mouth of the child with a glass pipette. This may be made in convenient sizes, and graduated, so that it may be evident how much is given at each feeding. It is well to feed small amounts often, and in the first days of life a child will rarely take more than a drachm given every hour or two. The child should not be removed from the incubator to feed it, but the cover should be taken off and the milk dropped into the child's mouth with the pipette. Such infants should not be bathed until they increase very considerably in strength. It is possible to maintain cleanliness by replacing a portion of the cotton envelope of the child as often as it becomes soiled. When the infant is sufficiently strong to bear manipulation, it should be gently rubbed with olive oil, two parts, and alcohol, one. Such a child may be given water freely in the same manner in which it is fed. The degree of heat which a child requires in an incubator varies somewhat with the development and peculiarity of the child. For the first two or three weeks of life children are most comfortable at a temperature varying but a few degrees from 90° F. After this they seem best satisfied with a temperature ranging from 80° to 85° F. The change from the incubator to the external air must be brought about very gradually. Light woolen clothing may be placed upon the child over its cotton dressing. It may be exposed to sunlight, except in the hottest summer weather, with advantage. In removing a child from the incubator it is often wise to cover its head with a light, well-fitting cap.

Incubation for Infants during Illness.—The use of the incubator is adapted not only for prematurely-born children, but also for those who suffer from asphyxia at birth, or from hemorrhage, or from pressure during labor with following symptoms of shock. In cases of capillary bronchitis the incubator is also a useful means for promoting recovery. In these cases it is not so much the increased amount of heat which the child requires as the absolute protection from draughts which the incubator affords.

Removal from the Incubator.—The change from the incubator to the external atmosphere must be conducted very gradually. It is well first to remove the lid from the incubator at a time when the air of the room is most thoroughly warmed, and thus to use the incubator as the child's crib only. Then the child may be taken out of the incubator to nurse, with the precaution that the room in which the mother remains is warm, and as its power of suckling increases it may gradually receive all its nourishment by nursing, with the exception of the night feedings. Finally the mother will be able to nurse it entirely, taking the precaution to avoid exposure to cold. The abandonment of the incubator is greatly facilitated by warm weather, and also by the circumstances of the patient. Incubation is practised with the greatest difficulty where trained nurses are not available. In cases of very feeble infants, the entire attention of one nurse is requisite for the child, while an additional nurse is required for the mother. Among the poor, premature children must be sent to maternities to receive adequate care.

Artificial Feeding.—Where breast milk cannot be obtained, the problem of caring for a premature infant is rendered very difficult. Under these circumstances it is well to employ pancreatized milk, well diluted at first, gradually increasing the strength of the mixture. Dilution equally with barley water or oatmeal water is often useful in these cases. If the child is premature only, but vigorous for its period of life, it may digest a very dilute mixture of milk, cream, milk sugar, and lime water. In beginning with such a combination 1 per cent. fat, 2 per cent. sugar, and .5 of 1 per cent. proteid is quite sufficient.

Digestion, Assimilation.—The intestine of the premature child should be emptied by artificial means as soon as possible after birth. A copious irrigation with warm salt solution or small but frequent doses of castor oil are indicated. Digestion and assimilation will be greatly facilitated if this precaution is carried out. It is well also to give to prematurely-born children small doses of brandy well diluted. Two or three drops in two drachms of water every four hours will be found useful. It is also essential that strict cleanliness be maintained in the care of these infants by promptly removing soiled material from the orifice of the bowel and bladder. If the child is doing well, once daily it may be taken from the incubator before a warm fire, a portion of the body uncovered at a time and gentle but thorough massage be employed with a little olive oil, or with olive oil, two parts, and alcohol, one part. The eyes should be flushed with sterile boracic acid solution, and the mouth also cleansed in a similar manner.

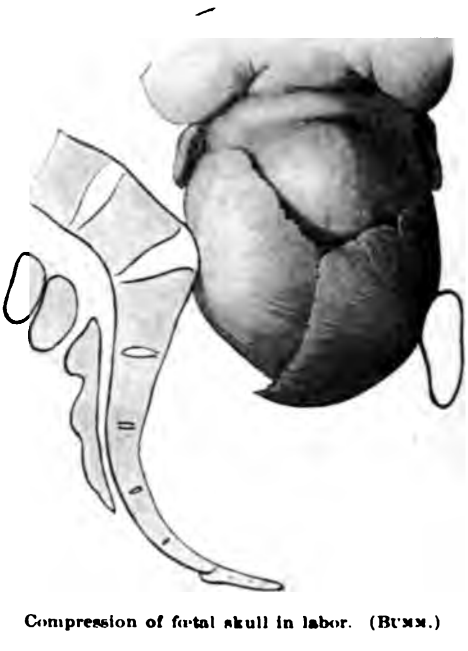
CHAPTER V.

INJURY AT BIRTH.

Injury by Pressure.—The process of parturition exposes the fœtus to dangers of mechanical injury. As long as the membranes remain unruptured the child is protected from injurious pressure by the amniotic liquid. When this, however, has escaped, the uterine muscle forces the child against the pelvis, and serious pressure may result. The fœtal skull will endure a considerable amount of force without injury as long as it is distributed over a large area. The elasticity of the bones and the arrangement of the sutures and fontanelles are such that, although the head may be pressed upon, it can endure considerable force without serious injury. When, however, the head is subjected to long-continued pressure upon a given area, the small bloodvessels of the brain in the corresponding portion become ruptured, and intracerebral hemorrhage results. The same effect is produced upon any of the large viscera of the body by long-continued pressure. Multiple extravasation of blood is observed in the liver, kidneys, spleen, lungs, peritoneum, and pleural membranes. If but little blood be thus lost, the infant may recover; but if a considerable amount has been expelled, the child will usually perish. Where the head is subjected to direct violence by the blade of the forceps or by promontory of the sacrum, the skull may be fractured and the bloodvessels of the meninges ruptured. The scalp may be severely bruised by pressure to such an extent that sloughing may follow. If the forehead be subjected to long and severe pressure, an effusion of blood may occur into the eyes. In cases where excessive violence is employed in delivery some of the viscera of the abdomen may be ruptured.

Prophylaxis.—Avoidance of pressure upon the fœtus during birth is a matter of great practical importance. The effects of cerebral hemorrhage are felt in the future development of the child, and while life may be saved, permanent injury to the brain may follow. It is of great importance that the physician should study his cases thoroughly to determine whether disproportion between the head and pelvis be sufficiently great to cause injurious pressure. It is better to subject the mother to delivery by surgical operation, if a living, healthy child be desired, than to allow her in prolonged labor to expel a fœtus fatally or permanently injured.

FIG. 266.



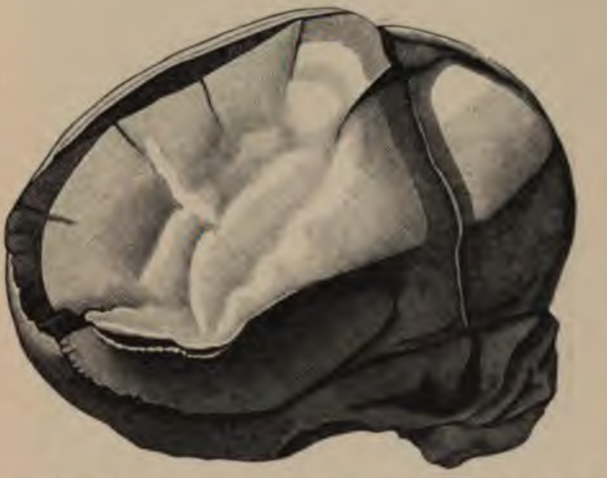
Compression of fœtal skull in labor. (BUMM.)

The operation of symphysiotomy is especially useful in protecting the life of the child in difficult labor. In well-selected cases the risk to the child is very little, and it is usually delivered promptly and with but slight complications. Infant deaths after symphysiotomy almost invariably arise from the fact that the operation is undertaken in cases where previous vigorous efforts have been made, sometimes for a considerable time, to deliver the mother with forceps.

In the management of labor the membranes should be preserved as long as possible. Their rupture to save time is never excusable. Care should also be taken to bring the head into favorable position to enter the pelvis, so that it may be only subjected to pressure at the pelvic brim for as short a time as possible. To accomplish this, care should be taken to bring the uterus with its long axis parallel to that of the pelvic brim, and this can best be done by the methods described in treating of the conduct of labor.

In assisting labor the physician will do well to omit the administration of ergot until the uterus is emptied. He will thus avoid subjecting the head to violent pressure through strong uterine contractions. The head, however, may be carried into the pelvis by suprapubic pressure, if the hands be applied to the sides of the head through the abdominal wall, or upon the occipital region. When the membranes have ruptured, delivery should be secured as soon as possible. If labor ceases to progress, the forceps accurately applied to the sides of the head will prevent injury to the child. The instrument selected should possess blades properly curved to fit accurately and smoothly upon the child's head.

FIG. 267.



Forcible extraction by the breech. Child stillborn, with fractured skull. (ROSINSKI.)

In case the skull has been subjected to severe pressure a distinct depression in the bones can be observed. If symptoms of compression of the brain develop, the physician would be justified, under antiseptic precautions, in incising the scalp and raising the depressed bone. Usually, however, dents and depressions in the head disappear spontaneously after a few days.

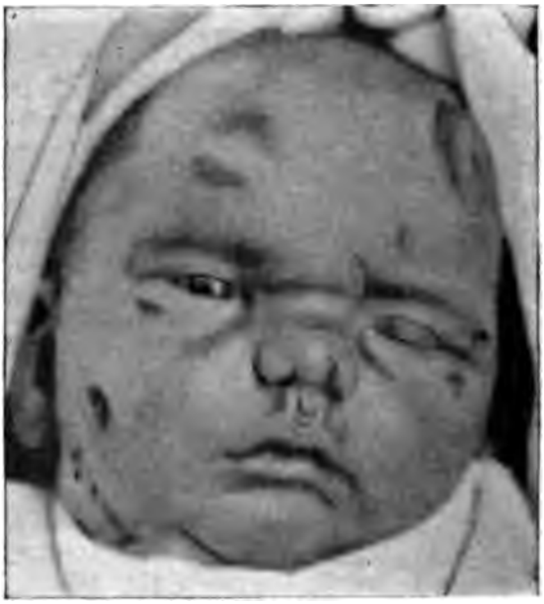
In cases of breech delivery where it is necessary to put the finger into the child's mouth to extract the head, the operator may wound the mucous membrane of the mouth by long finger-nails. If violence be used, the jaw may be broken. In performing such delivery it should be remembered that the finger in the mouth is simply to cause flexion, and that the delivery of the head is to be completed by traction upon the shoulders and suprapubic pressure.

In cases where the descent of the breech is slow it may be necessary to hook the finger into the groin, thus making traction upon the body. If care be used in this procedure, no injury more severe than bruising of the skin will occur.

Rupture of the Cord.—Rupture of the umbilical cord rarely happens during labor. At the moment of birth, however, if labor be precipitate and the child fall from the mother, the cord may be torn across.

Rupture usually occurs several inches from the umbilicus, and bleeding is usually checked by the retraction of the vessels. The cord is occasionally cut and imperfectly tied, resulting in serious or fatal hemorrhage. In these cases the cut ends of the vessels do not retract, while the ligature does not successfully occlude the vessels above. An excessively-thickened cord is often difficult to ligate, and hemorrhage may result in such cases. It is better in dealing with thickened cords to tie them temporarily, and after completing the labor to cut the cord freshly at the ligature, and strip it thoroughly from the umbilicus outward. It may then be retied with perfect control of bleeding.

FIG. 268.



Head bruised by forceps in case of deficient rotation; forceps could not be applied to sides of head. Child made good recovery.

In rare cases secondary hemorrhage from the cord results after ligature, and must be checked by passing two aseptic pins beneath the vessels at the umbilicus and applying a figure-of-eight ligature to them.

Fracture of Long Bones.—The fœtus may sustain fracture of the long bones during delivery. These are rarely complete or compound. The treatment of these cases consists in the application of very soft splints, padded with cotton, and bandaged with cheesecloth or gauze bandages.

In cases of fracture of the long bones in infants a very useful splint is readily made by dipping pasteboard in hot water, thus softening it, and bandaging it upon the limb. When the pasteboard dries, it becomes sufficiently firm to hold the parts in good position. Especial care is required in these cases to avoid injurious pressure, as the tissues of the infant are easily injured by undue force.

The results of these fractures so treated are usually good, the patient recovering without noticeable deformity.

Injuries to the Nervous System.—Injuries to the nervous system occurring at labor form an interesting field for investigation and study. Partial and complete paralysis may follow injury to the brain or severe contusion of large nerve trunks. Injury to the cranium may be followed by thickening and adhesion of the membranes of the brain, and development of irritating foci which may produce convulsions. Permanent wasting of muscles, with permanent disability, may result from severe pressure upon the axillary plexus or upon single, large nerve trunks.

In the treatment of these cases the first object must be to secure the best possible nutrition of the child.

Massage and electricity are of decided value in the further treatment of these children. A guarded prognosis must be given, in view of the possible occurrence of permanent muscular waste.

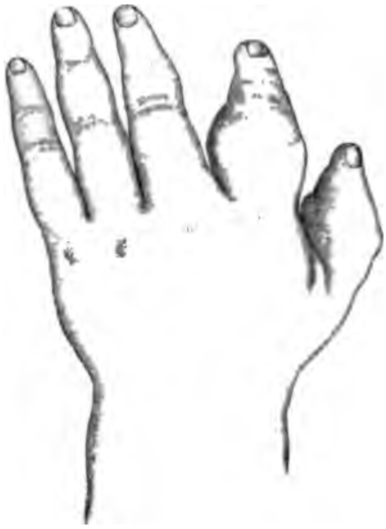
CHAPTER VI.

THE INFECTIONS OF THE NEW-BORN: HEMORRHAGE.

Fœtal Syphilis.—Fœtal syphilis is one of the most common and fatal of the conditions which affect the embryo and the child. The body of a fœtus the subject of this complication shows, upon examination, an enlarged liver and spleen, a partially macerated condition of the mucous and serous membranes, a deposit of fatty degenerated tissue about the extremities of the long bones, a catarrhal inflammation of the intestinal and nasal passages, with skin eruptions varying in appearance from roseola to patches of hemorrhagic condition, or of coppery discoloration. If infection is recent, the child may be born with the appearance of good health, but within a few days a rise of temperature to 101° or 102° F. occurs, with a characteristic rash and chronic nasal catarrh; inability to digest; an earthy, ashen color of the tissues, while gradual failure of strength and death complete the picture. The appendages of the syphilitic fœtus give ample evidence of the pathological process. The maternal surface of the placenta is dark in color, and contains abundant areas of grayish-yellow tissue, which is composed of infarcts at various stages of fatty degeneration. The membranes are grayish-yellow in many cases, the amniotic liquid is turbid, and the chorion especially is darker in color and more friable than in normal cases.

The degree of syphilitic infection and its course will depend naturally upon the virulence of the infection. Where both parents are syphilitic, the embryo will rarely reach the stage of full-term development. Where, however, the mother is healthy and remains unaffected, the child may be born with the appearance of health, developing the characteristic symptoms afterward. Where the mother is infected and the father is not, the child is undoubtedly syphilitic at the time of birth.

FIG. 269.

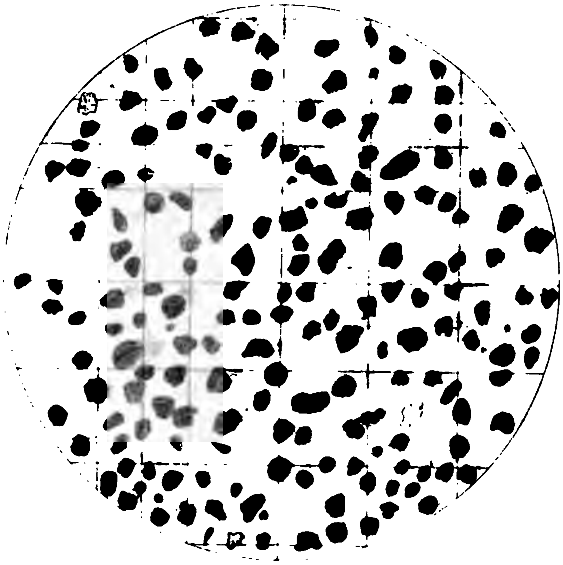


Syphilitic dactylitis. (SMITH.)

Treatment—The treatment of this condition consists in the prompt use of mercury by inunction. A piece of mercurial ointment, the size of the nail of the little finger of the adult, may be rubbed into an axilla or one of the groins of the child daily. Excoriated surfaces should be dusted with boracic acid or boracic acid and iodoform. If the mother is apparently sound, the child may nurse, unless its mouth is in a condition of ulceration or the mother's breast has sore nipples. Care should be taken to separate the child from the others if the patient is in a hospital, and scrupulous cleanliness and antiseptic precautions must be taken with its diapers and dressings. They should

PLATE XXXVII.

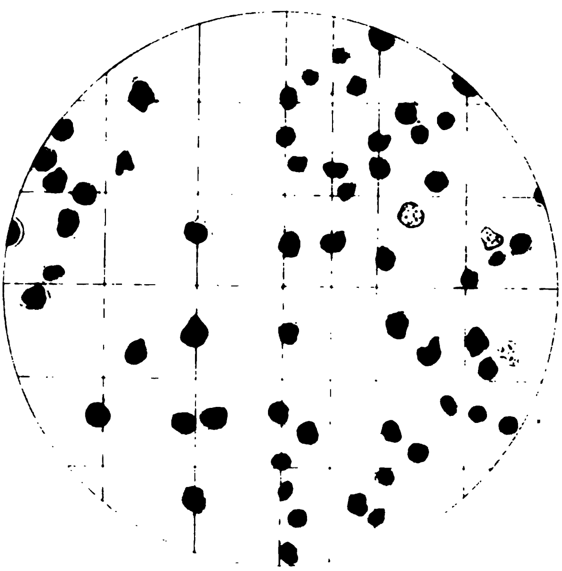
FIG. 1.



Blood of a Healthy Child One Month Old. Although Corpuscles show Crenation. Amount of Hæmoglobin is Normal.

Drawn from a Thoma-Zeiss Hæmocytometer.
Obj. 1/8 Reichert. Count made by Dr. D. Brayden Kyle. Drawn by Dr. W. H. Wells.

FIG. 2.



Anæmia of the Newborn. Total number of Corpuscles reaches possibly Five Million, of which not over Two Million are Normal.

Drawn from a Thoma-Zeiss Hæmocytometer.
Obj. 1/8 Reichert. Blood-count made by Dr. D. Braden Kyle. Drawn by Dr. W. H. Wells

be washed in bichloride solution, 1 : 2,000, after they are used. The anæmia from which these children suffer should be met by the ingestion of beef juice, small doses of alcohol, and the administration of olive or cod-liver oil. Fowler's solution may be given, and is usually well borne. The use of mercury should be pushed to the point of constitutional symptoms, usually manifest in an indication of diarrhœa or excessive formation of saliva. Such a child should, under no circumstances, nurse another healthy woman, because of the danger of infection. It is quite possible for the infant to infect the breast of a woman, not its own mother, through the secretion of the mouth. The chronic nasal catarrh of such children is best treated by disinfecting the nares with weak carbolic acid, ½ per cent., used in the form of spray or douche. While the mortality among these children is very high, a small proportion of them yield to treatment if promptly applied, and seem to make a recovery. They are, however, rarely perfect in development, and seldom attain to the normal stature or vigor of a healthy child. (Plate XXXVII.)

Septic Infection.—This may enter the body of the infant through any solution of continuity in its tissues, and is usually found in the umbilicus, in the mouth, nostrils, or eyes. Umbilical sepsis is caused by lack of proper antiseptic precautions, with direct contact of septic fingers, dressings, or instruments with the stump of the umbilical cord. The symptoms of this complication are in many cases the formation of pus at the umbilicus, a red and angry appearance of the tissues, which easily bleed, redness and swelling of the skin adjacent, with fever, rapid pulse, and symptoms of septic intoxication. In other cases no local appearances are present, the umbilicus being apparently clean and no induration existing in the tissues about. In these cases the constitutional symptoms are those of septic intoxication without inflammatory reaction. Upon post-mortem examination of these infants, the vessels leading from the umbilicus are the seat of thrombosis and embolism, while micrococci swarm in these vessels, in the lymphatics, and tissues surrounding them. If life has persisted for some time after infection, multiple abscesses may be found in the liver, spleen, and lymphatics of the abdomen. In other cases the only local sign which can be discovered is a dark and fluid appearance of the blood, without gross evidence of inflammation.

In recognizing umbilical sepsis attention must be drawn to the constitutional symptoms, and a diagnosis may be made rather from these than from local appearances alone. The child is peculiarly apathetic, loses appetite, is sometimes restless and again stupid, with rapid pulse and progressive failure of strength.

Treatment.—The treatment of this condition is primarily prophylactic. Many devices have been employed for thoroughly antisepticizing the umbilical stump and thus preventing infection. The cord has been cut short, and the stump seared with cautery. Antiseptic ligatures have been employed, the cord stripped, again ligated, and enveloped in an antiseptic powder with an antiseptic dressing.

The physician will often find among ignorant persons an interesting recognition of the value of a sterile dressing in the use of a charred rag. It is customary with some to wrap the stump of the cord in old linen which has been charred before the fire. It has been found, however, that the avoidance of umbilical infection depends more upon the strict practise of antisepsis by those who attend the patient than by any given procedure in dealing with the cord. If the cord is stripped and ligated with aseptic hands, the ligature material being antiseptic silk or linen thread, it is sufficient to envelop the stump in a sterile powder and wrap it in antiseptic cotton. Powdered boric acid, one part, and starch, five parts, oxide of zinc or iodoform are useful in dressing the cord. Borated cotton or simple sterile cotton is sufficient to serve as a dressing. Antiseptic gauze may be employed, although bichloride of mercury should be avoided as a rule in the surgical dressings of infants. The cord should be bandaged upon the right side of the child's abdomen, being held in position by a clean abdominal binder. The stump must be dressed daily, and the soiled dressing burned. If these precautions are taken, umbilical sepsis rarely develops.

When, however, the infection has occurred, but little can be done to check its progress. It is well to destroy any septic matter in the umbilicus itself by touching it with a strong solution of carbolic acid, followed by dusting with boric acid or iodoform. The further treatment of the case consists in stimulation and careful feeding.

The mortality of umbilical infection is very high. As reported from various large clinics, fully nine-tenths of children affected perish.

Conjunctival Infection.—Next to the umbilicus, the conjunctiva of the new-born is most often the seat of septic poisoning. This results usually from the presence of streptococci which accompany the germs of gonorrhœa. The poison is contracted by contact with germs present in the birth-canal of the mother during labor. Occasionally the infected finger of a nurse or physician may convey the poison.

The symptoms of septic infection of the eyes, commonly called ophthalmia neonatorum, are redness, swelling and local heat, speedily followed by the formation of pus. The discharge accumulates at the edges of the lids, so that the lids become agglutinated unless the eyes are frequently cleansed. The lids become thickened and swollen, so that the eyes may be completely closed. If the malady is not checked, or if the child is weak and depressed, necrosis of the cornea will occur, followed by perforation. In robust children the tissues may resist for some time, and while the lids remain slightly swollen, the cornea may escape serious injury. The discharge from the eyes in these cases is virulent and actively contagious, and may destroy the sight of others should contagion occur.

Treatment.—The treatment of ophthalmia neonatorum consists, first, in disinfecting the vagina as thoroughly as possible before labor in cases where a vaginal discharge indicates the possibility of contagion. Antiseptic precautions during labor are further indicated. As soon as the child is born its eyes should be cleansed in boric acid solution, and one drop of nitrate of silver, 20 grains to the ounce, should be dropped into the eye, to be immediately followed by gentle irrigation with a normal saline solution. This familiar method of Crédé is universally recognized as of great value in these cases. Should evidence of infection again appear, the most assiduous care is required to check its progress. The eyes must be thoroughly cleansed at frequent intervals, but in the most gentle manner possible. This is best accomplished by inserting in the tube of a fountain syringe a small glass pipette drawn to a fine point. Bichloride of mercury solution, 1 : 8,000, or saturated boric acid solution should be employed. If but one eye is affected, the other should be covered with antiseptic cotton, held in place by a bandage. The child should be laid upon the lap of the nurse or attendant, who has a rubber apron, the end of which is placed in a suitable receptacle. The head of the child is turned in such a position that the eye to be douched is lower than the other. A gentle stream of antiseptic fluid is then allowed to irrigate the eye, flowing outward between the lids, the pipette being directed toward the inner canthus of the eye. The stream will thus flow downward and outward, avoiding the other eye. Great care should be taken to avoid rubbing or scratching the epithelium of the part. For this reason antiseptic irrigation is especially valuable in these cases. The nurse may separate the lids with the thumb and fingers, thus allowing the fluid thoroughly to flush out the eye. When this has been accomplished, the eye should be gently dried with antiseptic cotton.

In cases of children in good condition, where the inflammatory reaction is violent, the use of cold is indicated. A large number of small bits of soft material which has been thoroughly boiled should be laid upon ice, and when thoroughly cold placed upon the eyelids. In cases, however, of feeble children whose nutrition is very deficient, applications should be made of soft material wrung out of hot water. It is prudent to dilate the pupils in these cases as soon as the inflammation becomes active. The use of nitrate of silver with these infants must be confined to the physician. The lids may be everted and penciled with a silver solution, 10 grains to the ounce, followed by irrigation. It is sometimes necessary to drop the same solution between the lids, following it by saline irrigation.

Success in treating these cases will depend not so much upon the antiseptic employed, as upon the frequency and regularity with which it is used. In cases which are taken promptly the eyes should be douched every hour during the entire twenty-four. Cold or hot applications must be constantly applied. In using silver solutions great care must be taken to avoid injuring the conjunctival epithelium. The eyes should never be rubbed, and should oozing of blood occur, it is usually an indication that too strong an antiseptic solution has been employed.

grow gradually less, the urine becomes clear, the child takes nourishment, and the depressed condition of the nervous system gradually disappears.

Treatment—In the writer's experience, the best results in treating infections of the blood in the new-born have been obtained by copious daily irrigation of the intestine with normal salt solution. This should be tepid in warmth, and as much should be introduced into the bowel as can be retained. It should be allowed to run out freely, and several ounces, if possible, should be absorbed. In connection with this the free use of alcoholic stimulation and carefully-selected feeding give best promise of success. In maternities cases of this sort should be isolated if possible, and should be considered as septic, and rooms containing such patients should be fumigated and cribs and bedding thoroughly cleansed. Severe cases are universally fatal, while milder infections in strong children are sometimes resisted.

Infection Through Breast Milk.—The new-born infant is also exposed to infection from the milk of a diseased mother. It has been found by observation that micrococci are sometimes obtained in the breast before labor. These may be taken by the child, even though no signs of septic infection are apparent about the nipple. Tubercle bacilli readily pass from mother to child. The course and symptoms of infection acquired in this manner are so gradual and masked that a diagnosis is often impossible in the beginning of the case. Later on, septic enteritis, with symptoms of ptomaïne intoxication, may make a diagnosis evident. But little can be done in treating these patients. The intestinal tract should be thoroughly emptied, preferably by irrigation. The patient's strength must be supported in every way. While with many patients the prognosis is hopeless, still others may occasionally survive and gradually regain health.

Infants may be infected by tubercle from the milk of a tuberculous mother. In these patients the breasts of the mother show thickening and hardening of the tissues, while a positive diagnosis is readily made by subjecting the milk to microscopical and bacteriological examination. The symptoms in these cases in the children are fever, diarrhœa, distention of the abdomen, emaciation, thirst, and, finally, the extension of the infection to the lungs or to the meninges of the brain. The treatment consists in at once removing the child from its mother's breast and substituting artificial food for the mother's milk. Cod-liver oil and creosote in small doses, one-fourth of a drop three or four times daily, well diluted, offer the best results in the way of treatment. Oil may be used by inunctions, olive oil being especially useful in these cases. The mouth of the infant should be examined for tuberculous ulcers, as it is possible for such a child having a tuberculous ulcer in the mouth to infect a wet-nurse should it be put to the breast of a sound woman. By reason of the danger of infection, the child should be bottle-fed. Should tuberculous peritonitis become evident, the abdomen of the infant should be opened at once and a drain of iodoform gauze be introduced. As a rule, however, cases of this sort terminate fatally with pulmonary or cerebral invasion.

Specific Infection in the New-born.—Localized septic infection of the mouth may follow the inspiration of gonorrheal virus or be acquired from a syphilitic sore upon the breast. A gonorrheal ulcer has sharply-defined edges, covered by a yellowish-gray exudate. It is most commonly situated upon the roof of the mouth, upon the tongue, and pillars of the fauces. With many patients its presence seems to affect the general health but very little, while in others digestion is deranged and general strength suffers. (Plate XXXVIII.

In rare instances new-born infants are attacked by infectious and contagious pemphigus. This usually appears in epidemics in hospital wards, and is characterized by the rapid development of small vesicles, accompanied by fever and prostration. Although often associated with syphilis, it may appear independently and in varying degrees of severity. Various portions of the body are affected, the face and chest being most frequently involved. The treatment of these cases consists in the free use of applications containing boric acid, either in the form of an ointment or a solution containing glycerin. The strength of these patients must be maintained by appropriate food and stimulants. In the milder forms the prognosis for recovery is good, while in severe epidemics the mortality rate is high.

Means of Contagion.—It is possible to convey these septic infections of infants from one to another by the hands and appliances of those who care for them. Thus septic poison may be carried to the eyes from the umbilicus, and from the umbilicus of one child to that of another, if cleanliness is not observed in applying the proper dressing. Where several children are cared for by the same attendant, strict precautions must be observed in the maintenance of cleanliness in the hands, while each child should have its separate toilet articles and separate dressings. In cases of septic diarrhœa diapers should not only be washed, but boiled in antiseptic fluids. Dressings employed upon the umbilicus should be burned as soon as removed, and appliances used for irrigating the eyes should be kept surgically clean. Those who attend infants are themselves liable to infection, as illustrated in cases in which nurses and physicians have suffered from septic ophthalmia. Intestinal discharges from these patients and also the urine are capable of infecting others, and hence should be sterilized as thoroughly as possible. In hospital wards children should be given separate cribs, and isolation practised with those who are diseased. Although the practise of antisepsis has reduced infection with the mother to a minimum, fœtal mortality from this cause remains unreasonably high.

Tetanus, Trismus, and Tetany in the New-born.—In rare instances puerperal tetanus is transmitted to the fœtus. Where the mother is profoundly infected, the child shares in this fatal complication. Epidemics are sometimes seen of localized tetanus, known as trismus neonatorum, or of a milder form known as tetany.

The symptoms of trismus neonatorum are spasmodic contracture of the muscles controlling the lower jaw, frequently accompanied by spasm of the muscles of the trunk and extremities. These attacks are excited by efforts to nurse or to drink, and in severe cases by any contact with surface nerves, even a current of air being sufficient to excite a spasm. It is impossible for the child to take nourishment; and if a tube be introduced within the stomach, it must be done under partial anæsthesia or the influence of a narcotic, the child's breathing frequently becoming very much embarrassed during the procedure. Recovery of children from this disease is rare, as the strength speedily fails, while fever develops, with exhaustion and cerebral or pulmonary œdema. Treatment should be addressed to modifying the spasmodic condition by the use of hydrate of chloral, a grain in syrup and water for a child six months of age every two or three hours. Alcohol should be employed as freely as the child will take it, and serves a very useful purpose in supporting the nervous centres during the attack. The child may be partially fed by the rectum, if the condition of the bowels permits. While the prognosis is unfavorable, it must be remembered that the infection is an acute one, and that it is possible for the organism to resist the attacking agent.

Cases of tetany sometimes arise without an evident source of infection, and seem to happen in certain times of the year and under climatic conditions of dampness and often of cold. The child betrays a tendency to spasm from any slight cause, but the spasm is of brief duration, the muscular contractions being not of a violent character. In mild cases the child can feed, sleeps fairly well, and under good care will recover from the disorder. The treatment of this condition consists in the use of the milder sedatives, antipyrin in half-grain doses for a child six months of age being given every two or three hours. Alcohol, beef juice, peptonized milk should also be employed, and the child's nutrition carefully maintained. Gentle massage with olive oil, with warm baths, is of great importance in these cases. The prognosis must be grave, but still in vigorous children is far from hopeless.

Thrush.—In cases where infants are artificially fed or where care is not taken to keep fermenting substances away from them, fungi may develop in the mouth, and by their presence occasion irritation and reflex nervous disturbances. Chief among these is the fungus known as thrush or sprue. This is seen in collections of white patches upon the tongue and about the floor and sides of the mouth, and in aggravated cases the fungus occasions sufficient reaction to cause inflammation. The child is fretful, often desiring to put the finger in the mouth, while occasionally masses of the fungus are swallowed, and occasion disturbance in the stomach and intestine. This condition is to be distinguished from aphthæ, from follicular tonsillitis, and from diphtheria. In aphthæ the patches are of a darker gray, and most often found upon those portions of the mouth which come in contact most readily with the finger or any article introduced within the mouth. In follicular tonsillitis the masses are smaller and often faintly yellowish, and situated upon the tonsil. In diphtheria the patches are a dirty gray, the tissues about are reddened, and the patches are situated upon the fauces and not upon the tongue or cheeks.

Treatment.—The treatment of thrush consists first of all in removing from the child's diet fermenting articles, and especially cane sugar. If the child requires sweet, milk sugar or saccharine may be employed. In destroying the fungus two objects must be kept in mind—first, the application of a proper antiseptic to the fungus, and, second, the avoidance of wounding the tissues. Although many substances have been tried to destroy this invader, experience has shown that none is so efficient and harmless as boric acid. This may be combined with glycerin, with sufficient water to make a convenient solution, and applied to the diseased surfaces by a very soft camel's-hair brush. In cases where the child resists applications of this sort, the remedy may be introduced into the mouth by spray. It is sometimes desirable to employ a dilute solution which may be swallowed without injury. Where gastro-intestinal irritation is occasioned by thrush, it is well to empty the intestine thoroughly, and then to administer a dilute solution of boric acid in small but repeated doses.

A useful borated solution for these cases is made as follows:

Powdered boric acid	grs. 60.
Glycerin	℥ 1.
Water to make 6 ounces.	

Diphtheria.—One of the most dangerous forms of diphtheritic infection is that of the post-nasal region. The throat may be free from deposit, but the child ejects from the nostril or from the mouth a dark mucous secretion, sometimes slightly offensive in odor, and sometimes streaked with blood. The symptoms of constitutional prostration are out of proportion to the extent of the lesion or its apparent severity. The temperature may be even below normal, but the pulse is rapid, the child feeds poorly, and is apathetic. In such cases, wherever possible, the services of a specialist in diseases of the mouth and throat should be secured. Under proper manipulation the nares, posterior nares, and pharynx should be thoroughly disinfected, and the child given at once an injection of antitoxin. For disinfection in diphtheria in young children the following solution has been found of especial value:

Hydrogen peroxide	℥ 3.
Powdered boric acid	grs. 60.
Water to make 6 ounces.	

Used locally by means of spray.

Stimulants and careful feeding are also required in these cases, with a prompt renewal of the antitoxin injection should the symptoms demand.

PLATE XXXVIII.

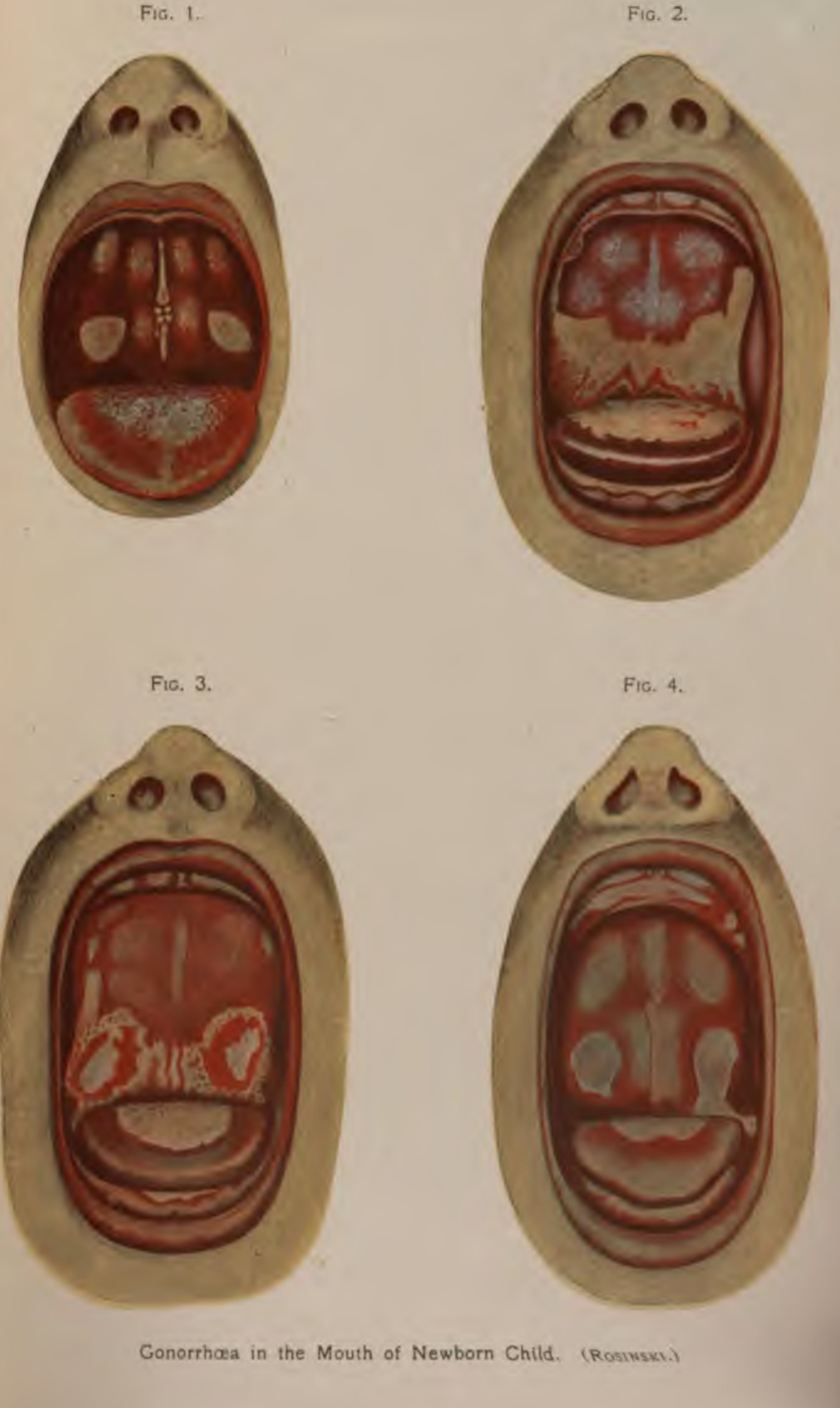


FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

Gonorrhœa in the Mouth of Newborn Child. (ROSINSKI.)

HEMORRHAGE IN THE NEW-BORN

The new-born infant is liable to several varieties of hemorrhage. Bleeding from the umbilicus may occur from improper ligation of the cord, or from an anomalous distribution of blood-vessels, or by reason of a disordered state of the blood itself. When the cord bleeds persistently, it should be stripped and ligated in several places. Bleeding from the umbilicus itself may be checked by the application of pressure, or by the passage of pins beneath the vessels with a figure-of-eight ligature drawn tightly about them. Pressure by a pad and bandage is also indicated. Cases are occasionally met with, however, where, in spite of all precautions, fatal oozing of blood from the umbilicus occurs.

Hemorrhage from mucous surfaces is observed in some infants. This is caused directly by an altered condition of the blood, and must be treated by those remedies which increase the red corpuscles and hæmoglobin. The condition which renders such hemorrhage from mucous surfaces possible is anæmia, which can usually be traced to a pathological condition of the mother before the birth of the child.

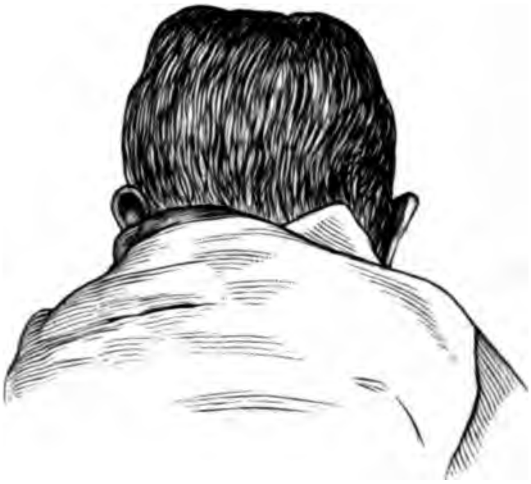
Infants occasionally die from profuse hemorrhage of the stomach and intestines, in which ulceration of the duodenum is found to be the cause. Thrombosis of the umbilical vein, persistence of the ductus arteriosus, and hæmophilia have been assigned as causes. Excessive secretion of the gastric juice, which had affected the mucous membrane of the intestine, has been assigned by some as the cause of this condition. The child may suffer from bloody stools and bloody vomit for several days. In rare cases the patient recovers. These hemorrhages are often described under the title melæna neonatorum. But little can be done in the way of treatment, as all remedies are practically unavailing.

Caput Succedaneum.—Collections of blood and serum are observed upon various portions of the child's body as the result of mechanical pressure during birth. By caput succedaneum is understood a boggy tumor upon the scalp, caused by the infiltration of the tissues with serum, and forming during labor. During the passage of the head through the pelvis the greater portion is subjected to pressure by the pelvic walls. There remains, however, a considerable area of the head which is not pressed upon, and in which serum and blood naturally accumulate. The caput succedaneum is found upon that portion of the head opposite the presenting part. As the vertex and left parietal bone most commonly present, the caput succedaneum is usually found upon the right parietal bone. By observing the position of this tumor the position and presentation of the child during labor may be reasonably inferred. Where the child has been subjected to severe pressure, the entire vertex of the scalp may become swollen, and the tumor cover the larger portion of both parietal bones. A secondary caput is sometimes observed in the median line upon the occipital region, in cases where the head has remained upon the pelvic floor for a considerable time after rotation has occurred. In cross-births a tumor may be found upon the shoulder which presents.

Caput succedaneum is not of practical importance unless the tissues become the seat of septic infection. Should this occur abscess will form, requiring incision and drainage. In cases where the scalp is greatly swollen, it is advisable to bathe the child's head with warm water or to apply an alcoholic solution of camphor. The application of ammonium chloride is also advised by some. If the tumor persists, it should be incised under antiseptic precautions, and pressure made with borated cotton. When abscess forms, the sac should be irrigated with creolin, ½ per cent.

Cephalhæmatoma.—An effusion of blood between the periosteum of the skull and the bone is termed cephalhæmatoma. An effusion of blood beneath the aponeurosis of the scalp is styled by some a false cephalhæmatoma. The mode of formation of the tumor is explained by the existence of the various layers of the periosteum of the skull. The blood clot, forming between the bone-producing layer and the bony tissue, prevents the growth of new bone. At the border of the clot the periosteum and bone unite. The exact method of formation in cephalhæmatoma is not always clear. Difficult labor does not produce it: it usually is found upon some other than the presenting part of the head; its borders are well defined; it does not cross sutures, nor does it alter the color of the scalp. Fluctuation is usually found over the centre of the tumor. It continues to increase steadily for some time after labor.

FIG. 270.



Double cephalhæmatoma. (AUTHOR'S CASE.)

Observation shows that an ill-nourished condition of the child undoubtedly favors the occurrence of cephalhæmatoma. While extravasations of blood may occur within the cranium, cephalhæmatoma is almost never found beneath the internal periosteum of the skull. Males are more frequently affected than are females, while the tumor generally occupies the right side of the head. Children born of primiparæ show this complication most often. On palpating such a tumor the sensation of doughy resistance is encountered, with obscure fluctuation over the centre. The sensation of crackling may be elicited, while the contents of the tumor appear to move in an irregular manner under palpation. The tumor is very rarely painful. The bony margin of cephalhæmatoma forms very gradually. The content of the tumor is extravasated blood, which is at first coagulated and then breaks down and becomes liquid. Soon after the formation of the tumor, if it be incised, the blood is found bright red, while later it is much darker in color. While the tumor is usually single, the writer has observed two upon the same infant, while three have been noted by others.

While direct and excessive violence may not be present in causing this condition, still the pressure upon the head during labor in an ill-nourished child must be considered as the primary cause. Hence it is that this condition may follow rough handling of the child by careless nurses after birth. The size of the mother's pelvis seems to have but little influence in determining this condition. Spiegelberg found cephalhæmatoma upon the head of an infant *in utero* before active labor began. It is quite possible that his belief that asphyxia had something to do with the formation of the tumor may have been correct.

Cephalhæmatoma may be followed or accompanied by cerebral hemorrhage, leading gradually to a fatal issue. In these cases a history of prolonged or vigorous labor is usually given.

Diagnosis.—The diagnosis of this complication is rarely difficult. It is readily distinguished from caput succedaneum by its sharply-outlined border, by the fact that caput succedaneum does not cross the sutures of the skull, by the difference in color, and the fact that cephalhæmatoma tends to increase after birth, while caput succedaneum gradually disappears. Cerebral hernia usually is found in the line of sutures near the occiput. Pressure upon such a tumor causes manifest irritation of the brain. Aneurism pulsates, and is much darker in color and lacks the history of cephalhæmatoma. In still-born children extravasations of blood may be found in the occipital region, somewhat resembling cephalhæmatoma. If examined, however, it becomes evident that they have been caused by pressure during birth, and that they are limited to the scalp. Examination of the skull by palpation will readily establish the differential diagnosis between cephalhæmatoma and encephalocele. Where craniotabes is present, detached and softened pieces of bone may give a sensation to palpation resembling that of cephalhæmatoma. Swellings upon the head in living children, caused by injury, are painful to the touch and are diffused.

Treatment.—The usual tendency of cephalhæmatoma is to reach its greatest size within six to eight days after birth. This would indicate that interference during the first ten days of the infant's life is unnecessary, unless the tumor increases rapidly through considerable hemorrhage. It is well to make gentle and continuous pressure by placing a pad of antiseptic material upon the scalp and retaining it by a suitable cap. Where, however, the tumor continues to enlarge, its surface should be carefully cleansed and thoroughly disinfected, and the tumor should be incised. It is better to open the tumor freely than simply to puncture it with a bistoury. It should be emptied and packed with gauze. In most cases it is best not to employ bichloride of mercury or carbolic acid, because of their poisonous properties. Boric acid or thymol may be used to advantage.

Hæmatoma of the Sterno-cleido-mastoid Muscle.—This muscle is occasionally the seat of fibrous change, which occurs at birth as the result of extravasation of blood into the substance of the muscle during or immediately following delivery. Breech presentation is most favorable for this complication, because these muscles are subjected to direct pressure during the extraction of the child. Torticollis does not accompany or follow necessarily this condition, although it is most common in prematurely-born children. Contracted pelvis does not seem to be an element in causing its production. While this condition is rarely serious, changes in the muscles may go on which would ultimately lead to permanent shortening. It is important that, before this may occur, the child be treated by suitable massage and manipulation.

Multiple Visceral Hemorrhage.—One of the most frequent and most obscure causes of infantile death is found in hemorrhage into the viscera, occurring during labor and continuing after birth. While pressure is the most frequent cause, intrauterine asphyxia is also a frequent factor. The condition of the child's blood is the principal predisposing element in these cases. Germ infection most often causes profound alterations of the blood, frequently occurring before birth and resulting in hemorrhage during labor. The symptoms of this condition are gradual failure in strength, circulation, and respiration, while the functions of digestion are in abeyance or but imperfectly performed. Fever is absent, and the child grows progressively weaker, finally perishing a few days after labor. Upon examination no lesion to account for the condition is apparent. Post-mortem examination reveals multiple hemorrhage into the brain, liver, lungs, and other viscera, and, in severe cases, into the substance of the muscular system. As the head is most often subjected to pressure, the brain is the organ most frequently the seat of this complication. Delivery with forceps, especially in cases where the instrument is applied with difficulty, is frequently followed by this condition. Meningeal hemorrhage may occur, with extravasation of blood beneath the dura. Evidences of intracranial lesions are wanting. In many cases, including forceps delivery, no lesion of the

PLATE XXXIX.

FIG. 1.

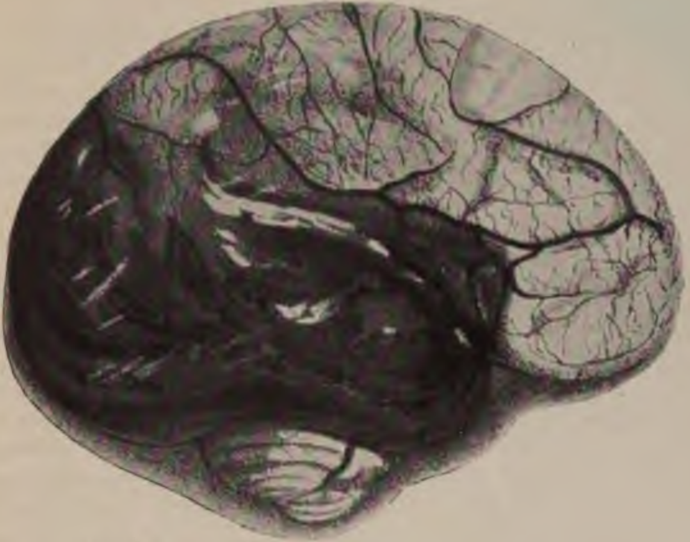


FIG. 2.

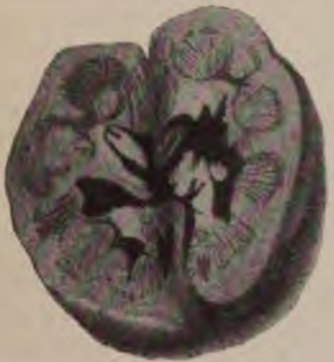


FIG. 3.

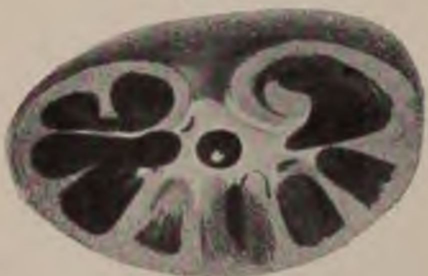
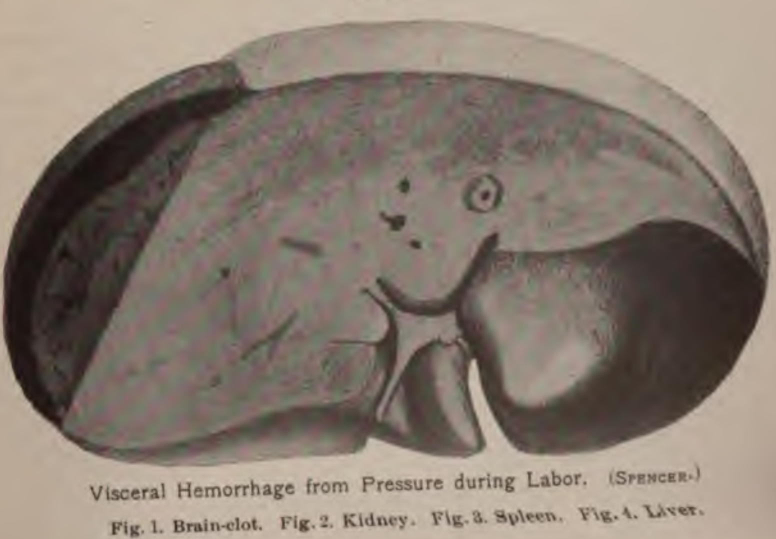


FIG. 4.



Visceral Hemorrhage from Pressure during Labor. (SPENCER.)

Fig. 1. Brain-clot. Fig. 2. Kidney. Fig. 3. Spleen. Fig. 4. Liver.

cranium can be found. Where hemorrhage occurs into the lung, pneumonia may supervene. Examination of the histories of these cases shows that most of them occur where considerable disproportion between the child and the pelvis exists. The mortality rate for visceral hemorrhage is high, although it cannot be accurately estimated, as many cases of mild degree do not prove fatal and are not subject to autopsy. (Plate XXXIX.)

Treatment.—The treatment of this condition lies principally in its prevention. Thorough examination of the mother before labor will lead to detection of abnormality in the pelvis, and also to excessive size of the fœtus. The induction of labor would then save the child from the dangers of this complication. In the presence of the actual condition but little can be done. If positive symptoms of cerebral compression develop and depression or fracture of bones of the skull be present, surgical interference is indicated; but unless such be the case, the physician's efforts must be addressed to maintaining the digestion and general strength of the child.

SECTION III.

THE DISEASES OF INFANCY.

CHAPTER VII.

ACUTE DYSPEPSIA AND ENTERITIS.

Dyspepsia.—Nervous children, or ill-developed and puny infants, not infrequently suffer from acute dyspepsia. The word dyspepsia signifies no more than difficult digestion, and is a term usually applied to purely functional disorder, without necessarily structural change in the organs of digestion. In children who are not properly cared for, pain may develop soon after taking food, accompanied by vomiting of a sour and often curded milk, and by a general disturbance in the well-being of the child. In some instances the difficulty is found in the fact that the child receives a greater amount of fat or casein than its digestive power can manage. In others an abnormal secretion of gastric juice results in undue formation of acid in the stomach, with the rapid development of irritating fatty acids, followed by the complete or partial emptying of the stomach. In other cases the phenomena is a purely nervous one, and no appreciable alteration in the secretion of the stomach can be observed. These cases do not often result from infection, although the lactic acid bacterium may be found abundantly in the rejected food.

Treatment.—The matter expelled from the stomach should be examined with litmus paper, to test the presence or absence of strongly acid reaction. The habits of the child and of its caretakers should be investigated to ascertain whether the child remains sufficiently quiet after feeding. Sometimes a nervous and excitable nurse, by repeatedly handling the child, will keep up a habit of nervous indigestion which is very difficult to break. In these cases the child should be put in the hands of a quiet, orderly person, who is careful to feed the child at exact intervals, putting it down after feeding in a comfortable posture, and allowing it to remain absolutely undisturbed. The quantity of food given should be lessened one-fourth to avoid a possible overtax of the digestive organs. Great difficulty is often experienced in securing a lessening of the food, because anxious friends, and even the mother of the child, may fear lest it should not receive sufficient nourishment. If the weather is suitable, the child may be placed in its carriage after feeding and taken into the fresh air, either to be kept still in the carriage or to be gently moved about, as the circumstances will permit. The administration of a small amount of pepsin immediately after feeding is often of service to these patients.

Where strongly acid matter is vomited, the condition can often be relieved by the administration of pepsin, or by using very dilute lactic acid immediately before eating. From three to five drops of dilute lactic acid may be given in a tablespoonful of water, slightly sweetened if the child requires it. When dyspepsia occurs, with the ejection of strongly acid curd, the amount of milk and cream should be diminished until the condition becomes better. An increase in the amount of lime water added to the infant's bottle is advantageous in some cases.

Dyspepsia of Nervous Origin.—Aggravated cases of dyspepsia in young infants are sometimes seen in which the child is thrown into nervous paroxysms by the ingestion of food. In these cases the administration of a sedative a half-hour before feeding will often relieve the difficulty. Bromide of sodium may be administered in doses of one grain to a child four months old, while with some children small doses of antipyrin, one-quarter of a grain to a child four months old, may be found useful. Children sometimes suffer from acute dyspepsia from the influence of cold or heat upon the nervous system. In these cases, if cold be at the bottom of the difficulty, the child should wear a flannel binder, while its clothing should be sufficiently increased by the addition of light flannel. The milk of the mother should always be examined in cases of acute dyspepsia to ascertain the presence of an excessive amount of fat or casein, or a marked diminution in either.

Enteritis.—Enteritis in young infants is almost invariably caused by infection. In children who nurse, the breasts may be tuberculous or septic before the milk forms, and the establishment of lactation affords an opportunity for the passage of diseased germs from the mother to the child. In bottle-fed children, milk which is not properly sterilized, or infected water, readily conveys disease to the infant. It is often difficult to detect the precise germ which invades the intestines in a given case. The colon bacillus has been found in the bowels of nursing children, while other forms of micro- organisms have been isolated in great numbers. Poisonous ptomaïnes may also be contained in mother's or cow's milk, and their presence will cause infection of the intestinal tract.

Symptoms.—The symptoms of enteritis in young infants are vomiting and purging, with a moderate elevation of temperature, irritation, and pain when the bowels move, a slightly distended abdomen, and a pulse of 110 or 120. The child is thirsty, and yet rejects nourishment when given by the mouth. The stools are green, sometimes being excessively liquid, and at other times resembling finely-chopped spinach. The child is excessively irritable, constantly thirsty, and its thirst is very frequently mistaken by the nurse or mother for hunger. The tongue is somewhat furred and coated, and the child lies most of the time upon its back, with its thighs slightly flexed. The child takes the breast or the bottle greedily, but soon rejects its food through the intestine or from the mouth, with evidence of distress..

In some cases the stools, instead of being greenish, are grayish or dark brown, and in place of an acid odor there is an odor closely resembling that of putrefaction. This is especially the case where ptomaïnes have been introduced through partially-decomposed food. If such a case goes on unchecked, the lactic acid bacterium, which may have been the first invader of the intestines, gives place to other and more active micro-organisms, the stools become serous or mucous, slightly tinged with blood, while muco-pus may be present in some cases. The child's abdomen becomes distended, its thirst increases, while its strength and weight rapidly diminish. Its face assumes a sunken appearance, its tongue is more heavily coated, while it frequently rejects its food, although taking water eagerly. The number of stools may become excessive, one every fifteen or twenty minutes, the child becomes apathetic, and finally lapses into a condition of partial coma. Symptoms of meningeal irritation may develop, and convulsions may be noted before death.

In some cases the acute stage of the disorder seems to have passed. The child's bowel movements diminish and become much better in character, its excessive thirst disappears, it even begins to take food, while its temperature falls from 102° or 103° to 100° F., or even less. Such a child, however, may develop within twenty-four hours a condition of coma, ending fatally.

Pathology.—If post-mortem examination be made in the case of children dying with acute enteritis, the mucous membrane of the intestine is found reddened and swollen, with the papillæ prominent. The large intestine is distended, and contains undigested milk and an abundance of bacteria. The contents of the intestine may be strongly acid from acetic, butyric, and lactic acids, or, if ptomaïne poisoning has occurred, an alkaline reaction may be present. The bloodvessels of the mesentery and omentum are found injected in these cases, the kidneys are hyperæmic, the spleen is softer than normal, while hypostatic congestion is often observed at the bases of the lung. In cases which die, comatose œdema is present, the ventricles of the brain being engorged with serum.

If the child has lived for several days, the heart muscle will be found in a condition of acute cloudy swelling.

Treatment.—The treatment of enteritis should be entirely based upon the fact that the disease is the result of infection. As milk is a favorable culture medium for bacteria, it should be entirely withheld from the child. The infant should take an abundance of water in small but repeated doses, and this water should first be boiled. The gastro-intestinal tract should be thoroughly emptied, as rapidly and completely as possible, by the administration of antiseptic purgatives and by very free irrigation of the stomach and intestine. The child must be fed a small amount of highly-concentrated nutriment which is free from bacteria. One of the most useful substances, because it is readily taken with water, is egg albumin in the form of white-of-egg water, already described. If a child receives a teaspoonful of this every half-hour, it will obtain a considerable amount of nourishment, while its thirst will be greatly relieved. Chicken broth can usually be retained, while beef juice is often well borne. Alcohol in the form of brandy, five drops for a child three months old and ten drops for a child six months old, should be given in a teaspoonful of water every hour or two. The best antiseptic purge is calomel, combined with sugar of milk or with bicarbonate of sodium. For an infant three months old, one-twentieth of a grain of calomel, with one grain of sugar of milk or a half-grain of bicarbonate of sodium, may be given every half-hour until bile appears in the discharges. When two doses of calomel have been given, the action of the liver will be hastened by thoroughly irrigating the intestine with boiled water. If the temperature of the child be high, the temperature of the water used for irrigation should be less than that of the body in health, and a temperature of 90° F. is quite sufficient. If the child has vomited freely and the vomit has not contained mucus, it is not necessary to wash out the stomach. If, however, the stomach is distended and the child has not vomited, the stomach should be washed until the water returns entirely clear. A spice plaster should be placed over the epigastrium, and the entire abdomen snugly bandaged with flannel. Heat should be applied to the extremities and to the occipital region, the child being very lightly covered, and, if the weather be hot, it should be placed in the coolest situation accessible and be sponged with tepid water and alcohol. Although many experiments have been made with antiseptic drugs, all are far inferior to intestinal irrigation. In desperate cases $\frac{1}{100}$ of a grain of strychnine and $\frac{1}{100}$ of digitaline are given by hypodermic injection every hour until the pulse improves; $\frac{1}{200}$ of atropine is often useful in these cases. The use of opium is not rational until the intestine has been thoroughly emptied. If the child is exceedingly restless and straining in the effort to empty the bowel, five drops of paregoric and five drops of brandy in a teaspoonful of water may be given every hour until the child is relieved. This treatment, however, should be used with great caution, lest the effect of the opiate be to increase the danger of cerebral œdema.

Chronic Enteritis.—Some of these cases resist the first invasion of micro-organisms, and the diseased condition of the intestine becomes chronic. The infant has six, eight, or ten stools daily, containing partially-digested milk, mucus, or muco-pus; the temperature is never very high, while the child rapidly fails, and finally dies from exhaustion. It becomes before death greatly emaciated, and there is often about the infant an almost cadaveric odor. Should the post-mortem examination of such an infant be made, the evidences of acute infection are present in but slight degree. The mucous membrane of the small intestine is pale, and the muscular coat much wasted and thinned. The stomach is chronically distended, and atrophy of the mucous membrane has occurred. The large intestine is also distended, and is the seat of a slow, necrotic process, which rarely goes to the point of perforation. The lymphatic glands, however, of the mesentery and peritoneum are enlarged, while the muscular tissues of the body and its fat have been greatly absorbed. This process of atrophy sometimes goes to the extent of breaking down the most resistant tissues of the body, as exemplified in perforation of the cornea, which occasionally occurs in the rapidly-perforating ulcer of von Graefe.

Treatment.—In chronic cases intestinal irrigation with antiseptics, as already described, is most useful. In chronic cases much may be done to increase the child's nourishment by inunctions with olive oil. The hand of the nurse should be thoroughly warm, and the oil should be slightly warmed and mixed with oil, two parts, and alcohol, one. The child should be gently but thoroughly rubbed, avoiding the abdomen or rubbing that portion of the body with great gentleness. A very considerable absorption will occur, and the child will gradually benefit from this procedure. Chronic cases are usually cured by a radical change of climate and surroundings. If such a child be taken to the seashore or to a considerable elevation in the country, its appetite and strength will begin to return in twenty-four to forty-eight hours. Life should never be despaired of unless the process has gone so far that excessive muscular wasting and necrotic changes have occurred through the entire body. In hospitals where considerable numbers of these children are together, strict antiseptic precautions must be observed with diapers and dressings. The crib, bedding, wards, and furniture must be kept surgically clean and thoroughly disinfected at frequent intervals.

Enteritis from Unclean Milk.—A much less dangerous but obstinate form of enteritis is occasionally observed in children in favorable surroundings who have been fed for some time upon unclean but not actively poisonous milk. In these cases the stools are not so frequent as to occasion alarm; the child partially digests its food, but gradually loses in weight and is exceedingly fretful. With such cases it is well to withhold milk for a week or ten days, nourishing the child by broths, beef juice, egg water, barley water, barley jelly, oatmeal gruel, flour ball, and finally restoring milk by a very gradual administration of Pasteurized and pancreatinized milk and cream. In these cases, in addition to intestinal irrigation, one-quarter to one-half of a drop of creosote, given twice or three times daily and well diluted, is often of considerable service. Where such children are in a cool climate, from ten to thirty drops of olive oil may be given three times daily with advantage. The following combination is especially useful in these cases:

Olive oil	2 parts.
Glycerin Yolk of raw egg	each 1 part.

Dose, from 20 drops to 1 teaspoonful two or three times daily.

Great care is requisite in gradually resuming the use of milk. But one feeding of milk daily should first be tried, and if this is well borne the quantity and frequency should be gradually increased. Some children require a preparation of cereals to enable them to digest the milk. Convalescence is hastened in these cases by all measures which tend to increase the general strength. Sponging with cool water, massage with olive oil as described, and a good climate are requisite for a complete recovery.

CHAPTER VIII.

RESPIRATORY DISEASES OF INFANCY.

Catarrh of the Respiratory Organs.—Catarrh of the nasal passages in young infants may result from exposure to cold and damp, from the presence of an irritating substance in the nose, from abnormalities in the structure of the bones or tissue, from syphilis, or from some failure of nutrition, such as accompanies rhachitis. Cold-catching in infants commonly means that the nutrition of the child is bad, and that its care is deficient in that it is subjected to too great heat or is improperly clad. The keeping of infants in overheated rooms is a powerful factor in predisposing the child to nasal catarrh. Rooms heated by a furnace are especially bad, and no child should inhabit them if possible to avoid it. The open fire of wood or coal and the window ventilator are special safeguards against cold-catching. Children who inherit gouty or rheumatic tendencies are especially predisposed to nasal catarrh, which is often obstinate, yielding only when attention is given to the child's diet and assimilation. Infants who inspire irritating dust suffer from nasal catarrh as a consequence, as is seen in children living in filthy surroundings and exposed to the dust from rags or from other materials in which the parents may work. The nasal catarrh of the syphilitic child is the peculiar coryza seen so soon after birth and going on, if unchecked, to the production of a mucous patch or patches in the nostrils. Nasal catarrh in infants may also be brought about by the existence of a nasal polyp, which occludes the passage and maintains the mucous membrane of the nose in a state of chronic congestion and irritation. Hypertrophy of the turbinated bones or their membrane, enlargement of the tonsils, especially of the lingual tonsil, or congenital malformations in the bony structure of the air passages render this complication of childhood very much more frequent. The children of tuberculous parents, unless carefully guarded, are very apt to develop a catarrhal condition of the nostrils.

Treatment.—The treatment of this complication consists in removing the cause. Nasal catarrh should not be allowed to persist in a child without having an examination made of the nasal passages, and an effort to determine the presence of malformation or enlargement of the tonsils or other portions of these tissues. Such abnormal conditions must be rectified by operative or other treatment. It must be remembered that in most of these cases malnutrition or malassimilation lies at the bottom of the trouble; hence such infants should be given small doses of Fowler's solution well diluted, cod-liver oil, or olive oil, or one of the most easily-digested preparations of iron. In infants who inherit gout the diet of the child should be carefully regulated, while the child should take a considerable quantity of water.

The local treatment of this condition consists in keeping the nares clean by sprays and douches of mild antiseptics or astringent materials. Thus boric acid solution, as already described, or dilute solution of alum, or normal saline solution may be used by the douche or by the spray. Such solutions should be warmed to blood heat, and should never be given in such a manner as to cause suffering or great resistance on the part of the infant. Many children suffering from obstinate nasal catarrh improve only when taken into fresh air. In these cases, wherever practicable, a change of climate, if only for a short time, is especially beneficial.

Bronchitis.—Infants as well as adults suffer not infrequently from bronchitis. Exposure to cold and damp, neglect to keep a child properly covered, or exposure to a draught may bring about this condition. A sudden change of climate, especially a sudden removal to the seashore during a heated term, may result in this complication. The symptoms of this disorder in the infant are increased respiration to 30, 40, or 50; increased pulse rate, 100 to 110; a moderate elevation of temperature, 101° or 102° F.; a cough, harsh in character, with derangement of appetite and digestion and temporary failure in strength. If auscultation be practised, no abnormal sounds are heard over the lower portions of the lungs, but over the large bronchial tubes the breath sounds are very harsh, and sometimes accompanied by harsh râles. In favorable cases the symptoms decline, the breath-sounds over the large tubes become softer, while the bases of the lungs remain unaffected. In unfavorable cases the symptoms are all aggravated, multiple small râles spread rapidly through the chest, and the respiration becomes exceedingly rapid, while the temperature rises.

Treatment.—The treatment of this condition consists in making mild counter-irritation over the bronchial tubes with a spice plaster, friction with camphorated oil, or, what is better, a chest pack may be made as follows: A piece of soft flannel is selected, long enough to pass completely around the child and lap over the breast. It is wrung out of water the temperature of the room in which the child is, and freely sprinkled with spirits of turpentine. It is then wrapped about the child, covering its chest as perfectly as possible. Over this is placed a dry flannel, and both are left upon the chest until the first has become thoroughly dried from the heat of the child's body. To allay the cough small doses of paregoric or syrup of lettuce may be employed. Attention to the condition of the bowels is always necessary. The popular belief that a large dose of castor oil serves to check these cases has had many coincidences to prove the assertion. In children of good strength and intelligently cared for, simple acute bronchitis of the large tubes yields readily to treatment, and the greater number of children recover. Where the cough is harsh the following combination, for a child eight months old, has proven successful:

Ammonium chloride	grs. 30.
Syrup of licorice Water	each ℥ 1.

Teaspoonful for cough as often as needed.

Catarrhal Pneumonia (Capillary Bronchitis).—By capillary bronchitis or catarrhal pneumonia is understood an extension of an infective or catarrhal inflammation from the larger bronchial tubes to the smaller and finer tubes. This process is often gradual in its development, while at other times it may suddenly bring the child into a very critical condition. Among the principal causes of this disorder may be reckoned simple bronchitis which has been neglected, contagious diseases, especially measles, a depressed condition of the general health and resisting power. The symptoms of this complication are very great acceleration in the respiration and pulse; the occurrence over varying areas of the chest of fine bubbling or crepitant râles. If the disorder comes on without interruption, a greater number of areas in the lungs will be involved. The terminations of the bronchi are often occluded by the abundant mucous secretion which is poured out, while some of the air vesicles have become collapsed because the terminations of the bronchi become occluded by the catarrhal secretion of the tubes. Percussion may detect little or no variation in the condition of the lung on account of the comparatively small areas involved. The congestion seldom endures long, the conditions changing very markedly within a few hours. Auscultation reveals the existence of fine râles, which are scattered through the chest in varying number.

Rapid increase in the respiratory rate, with rise of temperature, tends to weaken the patient, while in unfavorable cases the secretion in the lungs may so greatly increase as speedily to occlude the air vesicles, causing death by suffocation.

Treatment.—The treatment of capillary bronchitis or catarrhal pneumonia consists in making external applications of mild counterirritants to relieve the congestion which is present in these cases. As the great danger to the patient lies in heart failure or in respiratory failure, the action of the heart must be watched early in the case.

Digitalis must be given in small doses, two drops of the tincture to a child eight months old every four hours until an effect is noted. One one-hundredth of a grain of strychnine may also be administered to advantage in weak and puny children. Small amounts of alcoholic stimulants in the form of whiskey or brandy are indicated, while the child's food should be made as nutritious as possible, and the amount of milk offered to the child may be considerably diminished during such an attack.

One of the most prompt and valuable methods of treatment in these cases consists in the use of the pack applied to the entire circumference of the body from the umbilicus to the chin. The material employed should be soft flannel, which readily absorbs and gives up moisture. Such flannel may be wrung out of water at a temperature varying from 75° to 60° F., and if counter-irritation is desired a teaspoonful of spirits of turpentine may be added to a quart of water. Where it is not feasible to measure the temperature of the water, it may be that of the room in which the child is kept. The indications for the application of the pack are fever above 102° F., rapid breathing, harsh râles, and coarse breathing over the bronchial tubes, with rapid pulse and restlessness. Two or three compresses are necessary, one about the chest, one about the neck, while another may be passed in a figure eight around the neck and under the axillæ. Over this should be placed one thickness of the same flannel dry. It is unnecessary to remove this flannel, as it may be allowed to dry upon the child's body. The effect of such an application is to lessen very gradually the congestion in the lung, to stimulate the circulation, and thus to reduce gradually the irritation to the nervous centres which is causing the fever. The pack may be reapplied as often as necessary, and the temperature of the water may be lower than that which we have stated if the degree of fever present requires it. When the packs are changed, the child's body should be gently but thoroughly rubbed with dry flannel or a coarse towel.

Use of the Ice Bag.—In catarrhal pneumonia, where the temperature is very high and cyanosis and asphyxia threaten, an ice bag which does not leak may be applied over such a pack upon the child's back between the scapulæ. Whiskey or brandy should be given freely during such application, and the child should be carefully watched. If there is very sluggish respiration and circulation, strychnia and atropin should also be administered by hypodermatic injection.

The result of the use of the ice bag is often very satisfactory in desperate cases. In the writer's experience, cyanosis and asphyxia have disappeared, and the child has become permanently better after the application of the ice bag as we have described. This treatment, however, cannot be carried out by any but an intelligent and obedient person, and the patient requires close observation from the physician during the employment of this method.

Cyanosis.—The development of cyanosis is a dangerous symptom in these cases. The condition of asphyxia present is usually of the cyanotic sort, the child becoming a bluish, ashen color, while the pulse and temperature rise very considerably. This condition is to be met by an increase in stimulants, and by the prompt use of small, dry cups over the chest, or, what is better, the employment of the turpentine pack. This disorder is exceedingly fatal in ill-nourished and weak infants, who are unable to resist its insidious development and profound depression.

The inhalation of oxygen naturally suggests itself as a method of treatment in pneumonia complicated by cyanosis. It is questionable whether oxygen really finds its way into the lung, or whether its merit in this application does not consist in the fact that the gas escaping under pressure stimulates the patient's respiration. However this may be, the inhalation of oxygen should be used in these cases.

Pneumococcus Infection (Croupous Pneumonia).—Croupous pneumonia attacks infants less frequently than does catarrhal pneumonia or capillary bronchitis. The symptoms resemble those in the adult, while the sounds, on auscultation, are a tubular or bronchial breathing with râles, while percussion gives a considerable area of dulness. The temperature is 103° or 104° F.; the pulse 120, and respiration 50 to 70. If the child is vigorous, a favorable crisis may develop; but if the child be feeble, it will succumb.

Treatment.—The treatment of croupous pneumonia in young children consists of stimulation, the use of mild counter-irritants, and careful feeding. Excessively high temperature, 105° F. or over, calls for the prompt use of the cool or tepid bath or the application to the chest of the turpentine pack, which is usually of great value in these cases. The prognosis of croupous pneumonia must be very guarded, as heart failure or respiratory failure is not infrequent.

Pleurisy.—Pleurisy may develop in infants from the same causes which produce it in the adult. It is, however, less common proportionately than in grown persons. It occurs usually as a complication in some form of pneumonia, or comes on very gradually and insidiously in catarrhal pneumonia of long duration in feeble and ill-nourished children. But a small amount of fluid may be present, and the symptoms may be masked for some time. In view of the difficulty often experienced in obtaining a positive sign of dulness in infants, recourse should be had, whenever possible, to aspiration to make a positive diagnosis. A hypodermatic syringe is sufficiently large for this purpose. Such a needle as is employed in injecting antitoxin will answer every purpose. In cases of tuberculosis in infants pleurisy very frequently develops and aspiration of fluid from the chest should be practised. If the indications are present, the chest should be drained by methods usually employed in the treatment of these cases.

Croup.—By croup is understood a spasmodic contraction of the muscular fibres in the respiratory tract which is akin to asthma in the adult. The term membranous croup is but another description of a recognized condition, as it has so frequently obscured, by a false pathological conception, the diagnosis of diphtheria. Croup is most often seen in children who have, in the respiratory or digestive organs of the body, a constant abnormal condition. Thus, a child whose digestion is habitually disordered is subject to paroxysms of croup whenever the gastric filaments of the pneumogastric nerve become greatly irritated. Croup sometimes occurs in children who are recovering from bronchitis, or where an epidemic of influenza or bronchial catarrh is present. Exposure to cold and dampness may bring about an attack of croup. The symptoms of this disorder are a peculiar crowing respiration, a harsh, strident cough, paroxysmal in character, with symptoms of asphyxia and prostration, gradually becoming more pronounced as the paroxysms increase in number and severity. These attacks frequently come on at night, the child waking from sleep to struggle in its efforts to breathe.

Treatment.—The treatment of this condition consists, first, in relieving the spasmodic state of the respiratory muscles by the inhalation of small quantities of anæsthetic vapor. Either bromide of ethyl or nitrite of amyl may be used by a physician with immediate relief to the patient. When this has been secured, counter-irritation should be applied over the chest and throat by wrapping up the chest of the child in flannel, wrung out of hot water and sprinkled with turpentine, spirits of camphor, or alcohol. If the child is robust and the temperature is elevated, cool water may be taken instead. The sources of the reflex irritation should next be sought and removed. An overloaded stomach must be emptied by a teaspoonful of syrup of ipecac, for a child eight months old, repeated every half-hour until free vomiting occurs. The intestines should be emptied by a copious irrigation of warm water. To prevent the recurrence of the spasm, bromide of ammonium may be prescribed with bromide of sodium in the following prescription, for a child eight months old:

Bromide of ammonium Bromide of sodium	each grs. 20.
Simple syrup	℥ ½.
Water to make 2 ounces.	

Teaspoonful every hour if needed.

For a robust child of eight months chloral hydrate may be given, as follows:

Hydrate of chloral	grs. 6.
Simple syrup	ʒ 2.
Water to make 1 ounce.	

Teaspoonful every hour or two until four doses have been taken.

As anæsthetics can rarely be used safely except by a physician, and as they are not always available, they are not employed so frequently in these cases as the conditions would indicate. The usual domestic reliance is upon some form of emetic, and ipecac is found in most nurseries. Ipecac and paregoric in small doses are often employed, the child of eight months receiving two drops of paregoric and ten of syrup of ipecac every half-hour for three or four doses, until the symptoms are relieved. It is better not to put opium in the hands of mothers and nurses unless the physician can be sure of the experience and discretion of the person who has charge of the child. Croupy children should be subjected to thorough examination, to ascertain the presence of any cause exciting a reflex spasm of the respiratory muscles. The digestive system must be kept in good order, and often a radical change of climate serves to bring about a complete cessation of the disorder. Such children must be given tonics and cod-liver oil or olive oil, and have a tepid sponge bath daily. The tendency to croup seldom persists as the child grows older.

Asthma.—Asthma may develop in young children, with the customary paroxysms prevailing in the adult. It is sometimes seen in ill-nourished children, and is to be treated by the same methods employed for the relief of croup. Indeed, it is rare to observe in infants or young children asthma which can be distinguished from croup. A change of climate and all hygienic measures should be employed to build up such children and overcome the tendency to a recurrence of the difficulty.

Influenza.—Influenza with croup may attack the mother and her infant, and seriously complicate the lives of one or both. The symptoms with the adult are those which are seen in other patients and require no special description. With influenza, pulmonary symptoms are often severe, with obstinate cough, resulting in gradual development of catarrhal pneumonia, with frequently a fatal result to the infant. In treating these children, tendency to prostration so commonly seen in this disorder must be always kept in mind. Stimulants in the form of small doses of alcohol must be frequently given, while in severe cases strychnine must be employed if necessary by hypodermatic injections.

Sometimes infants manifest very marked symptoms of nervous derangement in these cases, in loss of sleep and great restlessness. Such patients must be treated by the use of paregoric with alcohol, by sponging with alcohol and water at night, and by persistent and very careful feeding. While influenza itself not very commonly attacks infants in its severe form, it is among the most dangerous and fatal complications of infancy. Its after-effects are often seen in a catarrhal inflammation of the middle ear, or in an obstinate nasobronchial catarrh which may persist for several months. The treatment of this condition from the first should be largely tonic and stimulant, and the patient must be carefully watched until the child has completely recovered.

CHAPTER IX.

DISORDERS OF DEVELOPMENT IN INFANCY.

THE infant is subject to various abnormalities in its developmen which, while not acute diseases, serve to increase very seriously it ultimate rate of mortality. One of the most common is rickets o rhachitis.

Rhachitis.—In many cases this begins before the birth of th infant, and seems to be an hereditary taint derived from either one o both parents. In these cases the cranium of the child seems especially to be affected, and the wide parietal portion of the skull, th overhanging forehead, and the thick wall of the cranium give evidenc of the presence of this disorder. The occurrence of intrauterin rickets may be inferred when the mother shows signs of the disease and when the skull of the child, by palpation, is evidently larger an heavier than normal. The presence of rhachitis in the infant *in uter* may very seriously complicate labor, especially in contracted pelves by greatly increasing the disproportion between the head and th pelvis. This must also be taken into account in selecting a method o delivery in a rhachitic pelvis. It is but reasonable to suppose that i the mother is rhachitic the child will also share her malady. As far as the treatment of this condition goes, before the birth of the infant but little can be done, except to keep the mother in the best possible condition. The intestinal tract of the mother should be properly emptied; she should have nourishing diet and plenty of fresh air. The question of the induction of labor should be raised as soon as a diagnosis of rhachitic pelvis is made, and if the head cannot be made to enter the pelvis, pregnancy should be prolonged with a view of delivering an older and stronger fœtus by some appropriate form of operation. In inducing labor in these cases the operator must not be governed solely by the pelvic measurements of the mother, but must take also into account the probable abnormal size and condition of the fœtal skull. In delivering the rhachitic fœtus with forceps great difficulty is often experienced, since the head does not mould as does the normal cranium, while the increased biparietal diameter enlarges its size in precisely the direction where the greatest pressure may often occur. If version is made, the situation is not improved, as the enlarged skull is brought through the brim of the pelvis no more readily if the breech presents than if the cranium presents. It follows that, when the size of the fœtus is so great that the skull cannot be made to descend into the pelvis by pressure, the induction of labor, if the fœtus be rhachitic, will not improve the chance for mother and child, but, if anything, will greatly complicate the condition. A better result for both will be found in promoting the nutrition of the mother in the best possible manner, allowing her to go to term and then delivering her by abdominal section.

As the infant grows and develops the characteristics of the rhachitic skull which are present in intrauterine life will be still more plainly developed. The broad parietal bones of the skull and the overhanging forehead leave no doubt as to the pathology of the condition. The prominent sternum, with the rhachitic rosary where the ribs join the sternum, the bent long bones of the extremities, and the enlarged terminations of these bones assist in a diagnosis. Such children are generally deficient in power to assimilate, and bronchial and intestinal catarrh are frequent among them. Sweating of the head at night, delayed or irregular dentition, deficient development of some portions of the face, aid in completing the clinical picture. As growth proceeds the stature of the child may be deficient, while chronic catarrhal conditions of the intestine may lead to the decomposition of food and to a chronic distention of the bowel with gas. The female pelvis in such children suffers the gradual failure of development which is familiar in the adult. The power of resistance to acute disease is lowered, and hence such children become a ready prey to tubercular and other infections.

Treatment.—The treatment of infantile rhachitis consists in the persistent and faithful employment of all those agencies which go to promote the nutrition of the child. The feeding of the infant must be of the best, and an especial effort made to induce it to assimilate considerable quantities of food. Phosphorus in the shape of the hypophosphites may be given, or cod-liver oil and olive oil are clearly indicated. Small doses of Fowler's solution long continued, alternating with the iodide of iron, may be used to advantage. Massage and passive movements will be of value in developing the muscles and tending to stop the curvature of the long bones. Salt bathing and a good climate and an open-air life will all conduce to a favorable issue. It must be remembered that rhachitis tends to heal by the deposit of an abnormally large amount of bony tissue, deficient, however, in perfect organization. Hence such a child will be left, even should recovery ensue, with an unusually thick skull and with the characteristic enlargements in the skeleton. When this enlargement of the skull is but slight, it is not detected by the casual observer in adult life.

Disorders of the Lymphatics.—The lymphatic glands of the body often manifest abnormal conditions in infancy, which, while in some cases cannot be positively called disease, still vary greatly from the condition of health and predispose to acute disorders. One of the most common of these conditions is that of malnutrition, which was formerly termed scrofula. This loose and unscientific word was applied to all forms of chronic enlargement of the lymphatics for which no adequate cause was apparent. At the present time it has been well replaced by naming definitely the pathological condition which causes the glandular abnormality. In most cases enlarged lymphatics arise from the absorption of some form of infectious material. The tubercle bacillus may gain access to the body and be destroyed by active lymphatic glands. These, however, may remai enlarged for some time. Tubercular infection often ends i glandular abscess, the bacillus perishing in the presence of pus cocci which subsequently develop. In other cases enlargement of th lymphatics arises from constant absorption of ptomaïnes from th intestinal tract, while still other children show this condition cause by some focus of infection or irritation in the mouth. Whatever th cause be, enlargement of the lymphatic glands in an infant is alway a serious matter. The intestinal tract should be studied to detect a abnormality in assimilation, and the intestine should be thoroughl disinfected and the diet revised in such cases. Where tuberculou infection is feared the patient must be carefully nourished, an exces of fat being given in the food, while small doses of creosote may b used to advantage for a considerable time. In cases where th lymphatics of the neck and jaws are enlarged the throat must be care fully inspected to see that no focus of irritation and infection i present there.

In patients where no apparent cause is found, the child's nutritio should be put in the best possible condition. The blood should b examined microscopically, and the treatment based upon the form o anæmia which is present. If this condition be recognized early i infancy, and proper precautions be taken, a child may outgrow a stat of threatened tubercular infection and finally develop into a health adult. Painstaking and constant care, however, is needed to secur this result.

Where glandular enlargement persists in spite of tonic treatment alterative substances may be applied to the glands with friction Ichthyol is often used for this purpose in the following combination

Ichthyol .... grs. 10.
Oxide of zinc ointment }
Lanolin } .... each ʒ 2.
To be rubbed thoroughly over an enlarged gland morning and night.

Where softening develops and where it is desirable to avoid a scar, if possible, the softened gland may be aspirated and pus withdrawn, or a small opening may be made, the gland curetted with a small, sharp curette, the cavity washed with an antiseptic and packed with a narrow strip of gauze. If the packing be renewed for several days, the cavity will heal, and no extensive contraction of the tissues or scarring will result.

Deficient Development of the Nervous System.—In some cases infants do not increase in weight and size normally, although they are not the subjects of any acute disease process. In these infants it is often impossible to assign a rational cause for this abnormality, as the history of the child and its parents throws no light upon the condition. Sometimes the history of a severe nervous shock to the mother during pregnancy, or of a severe drain upon her strength, is obtained which seems rationally to account for the condition of the infant. As the child grows it is usually observed that the development of the brain is also less than normal, in common with the impeded development of the body. Dentition may be delayed or may be irregular. Speech is acquired slowly and often imperfectly, while in some cases the emotions are unusually violent, and in others seem to be considerably deficient. The size of the head in these patients is usually less than normal, the contour of the skull may be normal, or the forehead and centre of the skull may seem deficient in development. The child is slower in walking than is normal, and its general condition is that of good animal health, but of deficient stature and deficient nervous development.

But little can be done for these infants in the way of active medicinal treatment. If their powers of nutrition be preserved and carefully fostered, it is possible that slight improvement may take place until the child reaches the age where it may be sent to an appropriate school or asylum for the training of such children. Deficiency in the development of the skull has drawn attention to the modern operation of craniotomy or craniectomy, and cases are reported for this condition. While, theoretically, this procedure should give excellent results, its practical success has scarcely been sufficient to warrant great expectations from it. As such cases excite great grief among the parents and friends of the infant, everything possible should be done to ameliorate the condition.

Persistent Foramen Ovale.—A not uncommon and serious failure in development consists in the persistence of an open foramen ovale. As a result of this the fœtal blood is very imperfectly oxygenated, the child's color is partially cyanotic or bluish, the lungs are in a state of congestion, and the child's life is readily brought to an end by any intercurrent disorder. The symptoms of this condition are most prominently the bluish and partially cyanotic color of the child's skin. This is increased by exertion or upon disturbance. The child's cry is usually feeble, its pulse rapid and weak, while in some cases murmurs can be heard over the heart. In other cases murmurs are absent.

Treatment.—The treatment of this condition consists in keeping the child as quiet as possible, in the use of stimulants and in the careful avoidance of exposure to cold. If the child is breast fed, its chance for life is, of course, much better than if it be artificially nourished. An unfavorable prognosis must be given, and the parents must be warned that fatal cardiac syncope may develop at any time and upon the slightest provocation. These children occasionally live to the age of fourteen or fifteen, although they remain feeble, partially cyanotic, and very readily made ill by the slightest disturbance.

Cerebral Palsies of Infancy.—Among the most interesting of the disorders to which the infant is subjected before and after birth are those which affect the brain. In a large number of cases these affections result in palsy. Cerebral palsies are spastic in character, and, according to distribution, may be divided into hemiplegia and diplegia or paraplegia. Of these, the first is least common. The cerebral palsies of children usually follow coma and convulsions, followed by epilepsy, with characteristic mental impairment. As regards the site of the palsy, Sachs and Peterson found in 225 cases right hemiplegia in 81; left hemiplegia in 75; diplegia in 39, and paraplegia in 30.

Many of these palsies begin during intrauterine life, although some time may elapse before it is evident that the child's cerebral condition is abnormal. Many cases thought to begin during the first years of life date back to intrauterine existence. The two factors most powerful in causing these conditions are difficult labor and premature birth. Heredity plays also an important part, as does mechanical injury to the mother. Severe illness of the mother during pregnancy also produces these conditions. The writer had the opportunity to examine a child, aged sixteen, whose mother had typhoid fever severely before her birth. The child has spastic hemiplegia, which, however, is undergoing steady improvement. It is remarkable that syphilis seems to have but little influence in bringing about these conditions. Sachs has shown that tedious labor more often causes cerebral disease than does instrumental delivery. Asphyxia is also an important factor, and first-born children are naturally more exposed to this complication. The possible occurrence of injury to the brain during protracted labor should lead the physician to terminate delivery as promptly as possible, in accordance with the interests of the mother. Peterson and Spencer believe that hemorrhage into the spinal canal and cord is also a not infrequent cause of palsy.

In 75 per cent. of diplegias and paraplegias contractures and rigidity develop. The flexor muscles are most often involved. Choreic movements and atrophy of the muscles occasionally follow intrauterine cerebral disease, and also asymmetry of the body. Epilepsy and idiocy and all degrees of mental deficiency may be observed in these cases.

Large cerebral defects are frequently found upon post-mortem examination of these patients. Half of an entire hemisphere or of both may be lacking in these patients. In birth palsies meningeal hemorrhage is a frequent cause of the diseased condition.

The cerebral palsies of the new-born are classified by Sachs as follows:

CLASSIFICATION OF INFANTILE CEREBRAL PALSIES.

Groups.	*Morbid lesion.*
I. Paralysis of intrauterine onset	Large cerebral defects (porencephaly). Defective development of pyramidal tracts. Agenesis corticalis. (Highest nerve-elements involved.)
II. Birth palsies.	Meningeal hemorrhage, rarely intracerebral hemorrhage. Later conditions: **Meningo-encephalitis chronica, sclerosis and cysts; partial atrophies.**

Groups.	*Morbid lesion.*
III. Acute (acquired) palsies.....	Hemorrhage (meningeal, and rarely intracerebral); thrombosis (from syphilitic endarteritis and in marantic conditions; embolism. Later conditions: Atrophy, cysts, and sclerosis (diffuse and lobar); meningitis chronica; hydrocephalus (seldom the sole cause); primary encephalitis; polioencephalitis acuta (Strümpell).

The amount of damage which the child's nervous system sustains during labor may be inferred from the symptoms present in the first few days after birth. With extensive meningeal hemorrhage convulsions occur early, accompanied by paralysis. As regards the morbid anatomy of the acute cerebral palsies, Peterson and Sachs analyze the records of 78 autopsies as follows:

Lesions.	Number of cases.
Atrophy, sclerosis, and cysts (terminal conditions)........	40
Porencephalus	2
Hemorrhage	23
Embolism	7
Thrombosis	5
Tubercle	1
Total	78

A diseased condition of the bloodvessels, probably fatty degeneration, is undoubtedly present in many of these cases.

As regards the prognosis of congenital cerebral palsy, no definite knowledge can be obtained for weeks and months after delivery. Most infants severely injured during birth die soon afterward. If, after a short time, the child begins to improve and the improvement is steady, a more favorable view of the case may be taken.

Treatment.—As regards the treatment of cerebral palsies of infancy, the child should not be molested at first. It has been found by experience that interference does not expedite the child's recovery. Especial attention must be paid to the nutrition of the child, and sedative drugs employed as rarely as possible. Convulsions must be controlled by chloroform. But little reliance is to be placed upon drugs. The electric current and massage are indicated in the later stages.

Obstetrical Palsies (Birth Palsies).—In distinction from the foregoing are what are termed obstetrical palsies. These depend upon some manipulation during birth. They occur most often in cases delivered by the forceps or by version, and in those parts of the body where large nerve trunks are least thoroughly protected from pressure by overlying tissues. The brachial plexus is especially apt to be affected in cases where the arm is displaced during labor, and the physician must insert the hand into the uterus and dislodge the arm. Occasionally dislocation of the humerus will cause prolonged pressure, resulting in long-continued or permanent disability. Atrophy of the muscles and variation in the response to the electric currents are also present. A differential diagnosis between obstetric palsies and cerebral birth palsies is clearly set forth by Sachs:

PERIPHERAL PALSIES (OBSTETRICAL PALSIES OF BRACHIAL PLEXUS).	CEREBRAL BIRTH PALSIES.
1. Arm only affected.	1.. Hemiplegia or **diplegia common**; brachial monoplegia **rare**.
2. Flaccid paralysis with atrophy.	2. Spastic paralysis, with or without atrophy, with tendency to rigidity.
3. Deep reflexes absent, surely not exaggerated.	3. Deep reflexes increased.
4. Changes in electrical reaction from simple loss of faradic response to complete reaction of degeneration.	4. No changes in electrical reaction.
5. No convulsions.	5. Convulsions apt to occur and to be repeated.
6. Deformity and arrested growth of entire extremity.	6. Flexion contraction of fingers, wrist, and elbow.
7. Sensation may be impaired.	7. Sensation not affected.

Treatment.—As regards the treatment of obstetric palsies, the affected limb should be bandaged in cotton and kept perfectly at rest. After two weeks of rest, light friction and massage may be employed. In from four to six weeks after birth the mild faradic current should be used, but if this fails to affect the muscles the galvanic current should be employed. When contractures tend to develop, the affected limb should be put in a splint. Idiocy and imbecility follow injury to the brain acquired during birth or immediately afterward, and choreic movements not infrequently develop.

Congenital Epilepsy and Idiocy.—While we may not understand the exact mechanism by which the result is brought about, there can be no question regarding the development of epilepsy and idiocy following prolonged and difficult parturition. The physician must not be misled in overlooking an hereditary taint as the cause for this condition, but, aside from this, a sufficient number of cases have been observed to leave no doubt regarding the relation of cause and effect between prolonged labor and cerebral disease in an infant. This fact makes still more important the study of the pregnant woman before delivery, and emphasizes the necessity for pelvimetry and for the careful conduct of labor to avoid undue birth pressure. It is noticeable that most of these cases develop in children who were not delivered by forceps, but in whom birth was greatly prolonged, although spontaneous. This illustrates the value of the forceps as a conservative instrument, and emphasizes the necessity for its proper employment. It also draws attention to the value of other obstetrical operations which deliver the mother without the difficult and prolonged passage of the child through the unaltered pelvis.

In the treatment of these cases, if the study of the patient gives reason to believe that a point of irritation exists upon the inner table of the skull, probably the result of a partial or complete fracture occurring during birth, the operation of trephining is indicated. The non-operative treatment of these cases consists in good hygiene for the nervous system and patient and gradual development of such unimpaired faculties as the child may have.

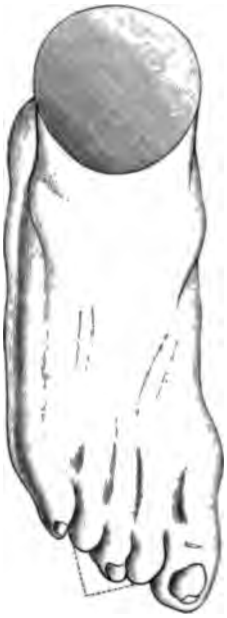
Microcephalus.—By microcephalus we understand a deficient development of the fœtal cranium. This is accompanied by deficient development in the cerebral mass, and by corresponding impairment in the growth of the child's intelligence. The shape of the child's cranium is characteristic, being notably smaller than the average, while the child's actions retain the animal type and do not pass into those of the intelligent human being. The effort has been made to improve these children by resection of the wall of the cranium. The physician must take care not to unduly excite the hopes of parents in these cases, and the operation should be undertaken with the distinct understanding that it carries a great risk to life and that it may accomplish nothing.

Dropsy of the Cerebral Ventricles.—In some cases hydrocephalus is present in moderate degree, accompanied by the internal collection of fluid in the ventricles of the brain. These children develop poorly in other respects, and the disorder may become apparent during the first few months of life. As with microcephalus, opening of the cranial cavity offers the only hope of material improvement, and even this may be followed by death or by no gain. Under these circumstances, while the operation may be undertaken at the risk of the parents, it must be with a full understanding of its possible dangers and disappointments.

ANOMALIES IN DEVELOPMENT.

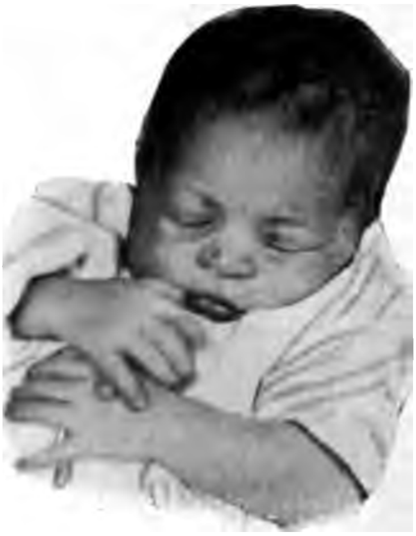
The child *in utero* is subjected to a considerable number of diseases, the relation and causes of which are not clearly understood. As the various layers of the ovum unfold some abnormality in these unfoldings may occur, resulting in false conformation and development. A not uncommon illustration is observed in the web fingers and toes, which are often found at the terminal phalanges, while the child is otherwise perfectly developed. No history is obtained in most of these cases of accident or injury to the mother. The deformity may be partly corrected by cutting the fingers apart, taking care that the surfaces be healed completely before dressings are removed, to avoid repeated adhesions. Rudimentary finger tips, if they are so imperfectly formed as to be useless, may often be removed to advantage in these cases. The fœtus may suffer deformity in development from the addition of phalanges to the hands and feet. It is not uncommon to see children who have an additional thumb upon one or both hands, and, as this extra digit is useless and impedes the use of the hand, it should be amputated. The occurrence of club feet is ascribed by some to deficiency in the amniotic liquid, and by others to partial adhesion of the amnion. Its treatment belongs to orthopedic surgery. Harelip and cleft palate result from the failure of the intermaxillary bone to unite the two halves of the mouth. Where harelip is the only abnormality present, it may be removed by a plastic operation. Where, however, the hard palate is extensively cleft, the case is one of great difficulty.

FIG. 271.



Deficiency in development of toes from amniotic adhesions. (STRASSMAN.)

FIG. 272.



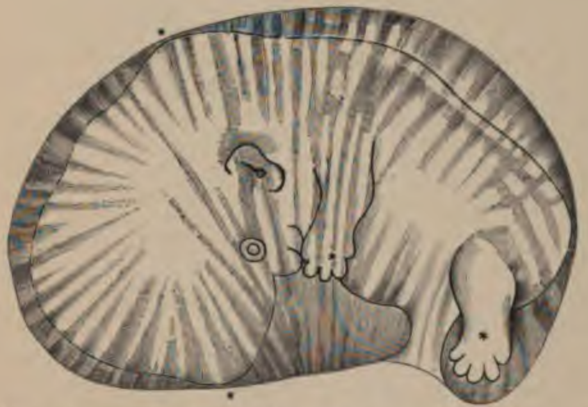
Supernumerary digits.

It is not uncommon for parents to notice that the child squints soon after birth. It does not, however, follow that strabismus will become a fixed condition, as such children generally recover as general development proceeds.

In male children one or both of the testes may remain within the abdominal cavity, and this condition become a permanence. Phimosis is also a congenital abnormality, which usually requires circumcision.

Phimosis.—The only treatment of phimosis which gives permanent relief is that of circumcision. It is rarely possible in these cases, by efforts at dilatation, to lessen adhesions of the mucous membrane sufficiently to relieve the child permanently. It is well to examine the parts after birth and to endeavor to dilate the tissues sufficiently to secure a thorough cleansing, and, if possible, by gentle dilatation during the first month of life, to obviate the necessity of an operation. Unless, however, this is readily accomplished, circumcision is by far the better procedure.

FIG. 273.

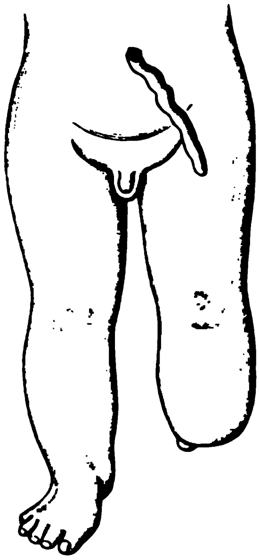


Deformity of fœtus from amniotic adhesions. Stars indicate points where such adherence is most frequent. (STRASSMAN.)

If the child experiences no difficulty in passing urine, the operation may be delayed until a favorable time of the year, or until the child is eight months to a year or eighteen months of age. Symptoms, however, of irritation arising from this condition should be carefully sought for, and if the child is fretful at night or experiences difficulty in emptying the bladder, delay should not be practised. The operation of circumcision in young children may often be performed without an anæsthetic, if the operator understands perfectly what he has to do. Careful antiseptic precautions are necessary, and if these be employed and hemorrhage does not occur, results are usually promptly satisfactory.

Operative Treatment.—To perform the operation in young children, the operator requires a pair of scissors or forceps whose handles close accurately together. These are to serve as a shield, in order that in removing the foreskin no injury may be done to other parts. He also requires a sharp scalpel or a pair of sharp scissors, several hæmostatic forceps with fine points, fine sterile catgut or silk, and a few small, curved needles, with needle-holder and dissecting forceps. These instruments should be made thoroughly sterile, and, in addition, two sterile marine sponges, a roll of boric acid gauze, and a T-bandage should be at hand. Anæsthesia is not to be employed. The child, having been properly cleansed, is to be laid upon a table and its body and limbs properly held by assistants. The operator then grasps the prepuce, drawing it gently down, and closing the handles of the scissors or forceps upon it to serve as a guard over the penis itself. This prevents any possible injury to the parts within. When this is accurately adjusted, the prepuce is removed by a quick cut along the outer border of the handles of the scissors or forceps. The tissues at once retract, and should be sponged with hot water and a sterile sponge. It will be found that while the external skin has been sufficiently removed, that the inner or mucous layer may remain unsevered and adherent. This must then be separated by the fingers of the operator, or by the blunt end of any convenient instrument; and if this separation is impossible, the tissue must be snipped or cut in the median line upon the anterior surface. When this tissue has been separated and drawn back, bleeding is usually well under control. The parts should then be sponged freely with hot water, and

FIG. 274.



Intrauterine amputation by amniotic adhesions. (STRASSMAN.)

made thoroughly clean. If bleeding points can be detected, they should be twisted by hæmostatic forceps. If hemorrhage is not present, the mucous and cutaneous layers should be brought as closely together as possible, and the parts bandaged by winding a narrow strip of borated gauze about the tissues, from the opening of the urethra to the surface of the body of the penis. If this is applied evenly and snugly, there will be no congestion following. This should be held in place by a suitable form of T-bandage, and the dressing should not be disturbed for twenty-four or forty-eight hours after the operation. A child will usually urinate freely, and symptoms of irritation are often very greatly relieved. At the first dressing the most convenient way to remove the gauze is to remove the child's clothing from its waist down, and to place the child in a bowl or tub of warm water. The dressing will then soak off, and the tissue will usually be found agglutinated, but not perfectly healed. The parts should then be freely powdered with boric acid, and a second dressing of gauze applied as before. In three or four days, in uncomplicated cases, the parts are perfectly healed.

Complications.—In excessively nervous children, where adhesions are tight and requiring careful separation, ether should be given. The plan of operation is the same as that indicated, with the exception of the fact that the mucous membrane must be divided upon the upper surface throughout its extent, and the adhesions very carefully separated. Under anæsthesia, the operator will do well to suture the edges of the mucous membrane and the skin by interrupted fine silk or catgut stitches.

If any abraded surfaces are left where adhesions were separated, they may be dressed by sponging with hot water, and then smearing with an ointment composed of ten grains of boracic acid and a half ounce each of lanolin and cosmolin. This will prevent further adhesions. A dressing of gauze is then to be applied, so adjusted that the end of the urethra is unobscured. This dressing is to be renewed twenty-four to forty-eight hours after the operation, and the stitches can usually be taken out, unless catgut has been used, on the fourth or fifth day. The results of this operation, even in unfavorable cases, are usually exceedingly good. Occasionally persistent and dangerous hemorrhage follows circumcision. This occurs from wounding one of the small vessels, and usually where the operator does not employ hot sponging, or where he operates hastily and applies an ill-fitting dressing. In these cases the parts must be at once exposed, sponged with hot water, the bleeding points sought for and caught with hæmostatic forceps. They must be ligated, and compression exerted by a well-applied gauze bandage. Septic infection may occur if cleanliness is not observed. Should this happen, antiseptic douching of the parts with carbolic acid or boric acid must be employed, with prompt incision and drainage if abscess forms. Many cases of septic infection after circumcision prove very rapidly fatal.

Hydrocephalus.—The diagnosis of this condition is made by feeling with the fingers the sutures and [illegible] of the head and observing that it is impossible to recognize the [illegible] outlines and landmarks. By palpation externally the size of the head will be noticed and its failure to descend into the pelvis. These cases are often associated with extensive failure of development in the child, so that its life would be impossible even if delivery were safely accomplished. In a case upon which the writer performed craniotomy the organs of the special senses were found imperfect in development, while the heart and blood-vessels were so abnormal that the infant could not have long survived. The feeble vitality and imperfect development of these children justify the obstetrician in conducting labor in these cases with reference to the interests of the mother only. The effort may be made to remove a portion of the fluid from the skull by introducing a trocar but a short distance and allowing a portion of the fluid to escape. Although this procedure is successful in some cases, it cannot be relied upon in cases of extensive effusion for a favorable result.

Fœtal Dropsy.—Fluid may accumulate in other portions of the body, in the pleural or peritoneal cavity, a condition which occasionally complicates delivery. The fœtus may be affected by general dropsy, and the result of this condition may be such an increase in the size as to render the child virtually a monstrosity. The cause of this condition is disordered excretion in the fœtus, and the result is fatal usually before birth.

Tumors of the Fœtus.—The fœtus may also develop tumors in various regions of the body. Thus goitre may become so large as to prevent entirely the flexion of the head and render delivery impossible. An ovarian tumor may develop and distend the abdomen, while sarcoma of the spleen may also be present.

Spina Bifida; Meningocele; Parasitic Embryos.—Failure in the development of the vertebra and the meninges may result in a protrusion of the tissues surrounding the spinal cord, known as spina bifida. This is most common at the sacral region. Should the child survive and gain strength, these cases should be treated by operation, incising the sac, dissecting it out and bringing the tissues together to form a new wall. Meningocele is also observed in the cranial region, the protrusion occurring through one of the sutures. The plan of treatment suitable for these cases is essentially the same as that pursued in spina bifida. In addition to tumors which develop within the body of the fœtus proper, there may be adherent to the fœtal body the partially-developed remains of a second fœtus. This is the result of twin conception, the second ovum having become blighted and developed but partially, although remaining adherent to the first. These parasitic embryos are usually attached to the base of the spine or at the back of the neck. It is sometimes possible to sever the connection, although in most cases the living fœtus must be sacrificed to secure delivery.

CHAPTER X.

DENTITION.

Development of Teeth.—The new-born infant occasionally has several teeth so well developed that they give the mother great pain when the child nurses. In the writer's experience it was necessary to remove such teeth from new-born children. This, however, is exceptional, and as a rule in healthy infants the first signs of teeth are visible between the sixth and eighth month.

The appearance of teeth in the infant's mouth is significant as marking certain epochs in the development of the child. Dentition itself is of comparatively little importance to the infant, but the peculiar condition existing in its nervous and digestive organs, by reason of the stage of development of which dentition is a sign, has caused this phenomenon to receive undue importance at the hands of parents and of many physicians. It is certainly true that in perfectly normal children dentition passes through its various stages without exciting especial comment. The appearance of a tooth in a perfectly healthy infant is often a surprise to its parent or caretaker. During the stages of development which are accompanied by dentition the infant, however, is undergoing a development which renders it liable to reflex disorders, and hence this period of life is often thought to be inevitably accompanied by disease.

The germs of teeth are present in the fœtus within the jaw at birth. In children born at term they do not begin to approach the surface until the sixth or seventh month. The teeth appear in two sets, the mouth being divided in the median line into two halves, the teeth corresponding upon each side. The first teeth to appear are usually the central incisors upon the lower jaw; then come the upper central incisors; then develop the incisors next to these, above and below; then come the four anterior molars and four canine teeth; and, last, the posterior molars, two upon each side. At the end of the first year the incisor teeth have usually been cut. Their appearance is often preceded by very little if any local irritation, as the cutting-edge of the incisor teeth makes its way most readily through the periosteum and mucous membrane of the gum. Then ensues a period when the child is from twelve to eighteen months old, when the anterior molars are commonly developed. These teeth come with more difficulty in some children than do the incisors, because their edges are less efficient in cutting through opposed tissue, but their evolution is rarely in healthy children the cause of noticeable disturbance. From sixteen to eighteen months of age to the end of the second year, and sometimes later, the child is passing through the period of development which is commonly spoken of as the second summer. At this time the largest teeth of the first or temporary set are appearing, the child's digestive organs are undergoing considerable developmen and, if this process occurs during the heated months, the heat predi poses to fermentation of the child's food and brings about a conditi in which the development of disease may readily occur. Hence th popular fear that a child will do badly in its second summer. Th last teeth to be cut, after sixteen or eighteen months, are the canine and the larger posterior molars. When these are well developed, th child speedily passes beyond its first stage of development, capable taking a mixed diet, gradually acquiring the power of speech, bein able to move independently, and passing from the stage of infancy t that of childhood.

Management of Dentition.—Dentition should be considered, a has been said, as simply a clinical index for phases of development i the infant. The first teeth at seven months mark the time when th child's diet may be enlarged by the addition of semi-fluid food. Such for example, is found in gruels, oatmeal, wheat, fine hominy, in th fatty material obtained by sucking a chicken bone or chop bone, by th pulp of ripe oranges, all of which substances in the healthy, robu infant will be digested and will improve the child's nutrition. If th mouth be inspected at this time, the gum in the upper and lower ja will be found slightly prominent in the median line, slightly darke in color than normal, while the secretion of the mouth may be considerably increased. This often gives rise to the discharge of mucu and saliva, which is known as drooling. The child desires frequentl to bite upon some smooth object, and is constantly putting article within its reach within the mouth. In some children a slight inte tinal catarrh develops, while others are somewhat constipated at thi time. The appearance of a tooth is characterized by no especia phenomenon, and the edge of the tooth is often discovered, accidentally, protruding through the gum. In children at this stage development great care should be exercised that the mouth be kep clean. The finger of the nurse or mother should not be put into th mouth unless the hand has been first thoroughly cleansed. Physician are often guilty of carelessness in thrusting dirty fingers into th mouths of children to examine the teeth. Those articles should b selected for the child's use which can be readily washed. Such ar rubber rings, or smooth ivory rings, or playthings too large to go fa into the mouth, but with perfectly smooth surfaces upon which th infant may bite. If the hyperæmia of the gum becomes excessive the mouth should be sprayed with the following solution:

Powdered boric acid	grs. 20.
Glycerin	℥ ½.
Water to make 4 ounces.	

This will usually be found grateful to the infant, and tend to sooth any irritation which is present. A dilute solution of thymol 1 : 3,000, may also be employed.

From the seventh month to the end of the year the incisor teeth wil appear at short intervals. During this stage of development th child's diet may be varied, while due attention must be given to the development of its muscular system. Free movements of every sort should be encouraged. The child's clothing should be perfectly loose, and it should be allowed to lie upon a bed, or, in summer, upon the floor, on a blanket, with as little clothing as is absolutely necessary upon it, so that it may move in the most free manner possible. The muscles of the back are well developed by placing a child upon a flat surface upon its stomach, when its efforts to raise its head and to raise the body from the surface on which it lies are often very interesting to observe. The child's limbs are in constant motion, while it will develop the arms and muscles of the chest by pulling upon the side of its crib, in the effort to bring itself to a partially standing posture. In winter, and in draughty houses, it is not safe to put an infant at this age upon the floor. A suitable bed or crib should be selected, and a fence built around it in such a way that it will be impossible for the child to fall or to become caught in the surrounding railing. A frame or fence whose slats are close together may be made to fit upon the bed, the surfaces being carefully rounded and smooth, so that no points of roughness will be present. In hospitals, a hospital bed of the usual size may be enclosed by a railing, making an excellent exercise ground for such infants. Massage should be practised daily by the nurse at the time of the bath, and a small amount of oil should be used at this time.

The care of the infant's skin during this period of development is of great importance. The child should be clothed in thin flannel, its abdomen protected by a thin flannel binder, its feet covered by knitted socks. In extremely hot weather all clothing may be removed from the child, and it may be placed upon a blanket upon a suitable bed, protected from a direct draught of air. If the child is vigorous, its daily bath may be a plunge in a rubber bath-tub or in a metal or porcelain tub. The temperature of the water should be 100° F., being cooled down, while friction is continued, to 80° or even 70° F. The child should be first thoroughly washed with soap and hot water, and as the bath is cooled friction is employed, thus giving a distinctly tonic effect at the close of the bath. Such a bath is usually enjoyable to the child, and increases the circulation of blood in the skin. Massage may be given after the bath, or, if the child be restless, a warm sponge at night, followed by gentle massage with alcohol and olive oil, is often useful in promoting sleep.

Nervous Disturbances During Dentition.—The nervous disturbances sometimes met with in children at this period of development are best removed by the strict observance of quiet after feeding and a liberal supply of fresh air. The child's nursery and sleeping rooms should have ventilators placed at the lower edge of the sash, giving entrance to air without draught. Wherever possible, an open fireplace should be in the play-room and sleeping-room of the child. In a changeable winter climate a child can be perfectly well who is not taken into the open air for the first winter after its birth. At certain hours of the day, when sunshine is brightest, the child should be suitably clad and taken in the arms of its nurse, or in its carriage, to a room exposed to sun, but not to wind, in which the windows are freely open. It may be kept in this room for one or two hours, and thus given the same exposure to external air without the dangers arising from dampness, and from many of the noxious materials which are found upon the surface of the ground in large cities. If this be done with regularity and fidelity, a child will thrive and its risks of contagion be very much diminished.

Each infant is entitled to its own crib in which to sleep. Under no circumstances should an infant sleep in bed with its mother or nurse, for many reasons. A mattress upon which the infant sleeps should be of hair, its pillow low, its bedding light woolen blankets, without heavy spreads. A down coverlet, as so commonly used in Europe, is an excellent source of warmth, and is very light.

Diet After the First Year.—At the end of the first year of infant life the child should be capable of eating well-baked bread and simple, properly-cooked meat; and if the child be vigorous, a little well-roasted and mealy potato, with butter and salt, may also be taken. The pulp of an orange, the soft part of stewed prunes, the pulp of a baked apple, will be found useful in promoting appetite and digestion. During the winter months many children are fond of syrup spread upon bread, and of this the best is molasses of the sort known as New Orleans or sugar-house molasses. This has a favorable laxative effect with many children. From the age of one year to the time when dentition is complete, from twenty-four to thirty months, the diet of the child should be gradually enlarged as its development proceeds. Broiled or boiled fish in season, the soft portions of oysters, chicken, mutton, and lamb are the best solid food in the way of meats. Boiled rice, a limited amount of potato, spinach, stewed fruits, are most successful as an addition to the meats already mentioned. Light puddings, such as rice and cornstarch, may be taken in moderation. Bread should always be thoroughly baked, and may be softened by soaking it in milk, or may be taken with the dish gravy of roasted meats. Milk and water are the only beverages allowed, an exception being made in the case of the lightest form of cocoa for hearty children in cold weather. In children deficient in weight and strength, an abundance of good fat should be taken. Of animal fats, the fat of mutton and fish is best. Vegetable fats are best taken in some of the vegetable oils commonly sold under the name of olive oil. While it is difficult to obtain a pure sample of olive oil, still substances most often substituted for olive oil are frequently pure and harmless as articles of food. Such are principally cottonseed and peanut oil. While butter is usually relished by children, it is of less nutritive value than are the vegetable oils.

The Coming of the Larger Teeth.—The second summer, or time of cutting the larger teeth, should be anticipated, if possible, by careful scrutiny of the child as this period approaches, and by securing for it a proper climate. If this period of the child's life will come during the summer, it should be taken from the city early in the spring and given the advantages of the open air. The latter portion of winter is often a trying time for children, as infectious diseases are frequently epidemic at this portion of the year. Care should be taken that the child's digestion is kept in good order, and that its nutrition is especially considered. In seeking a change of climate it must always be remembered that an infant will frequently do better in large rooms in his own house, where his surroundings can be controlled, than in small rooms at a hotel or boarding house. Fortunately, at summer resorts near the large cities there can usually be found suitable apartments where children can be properly cared for. Where families have summer residences, the problem becomes much more simple.

Complications of Dentition.—The disorders of dentition, regarding which so much is frequently written, should be studied as complications of development rather than as diseases immediately attendant upon the appearance of teeth. These may be conveniently considered under two heads: First, disease of the mouth occasioned by infection during dentition; and, then, other manifestations of the period of development and its abnormalities through which the child is passing. The first and most common disorder of the mouth during dentition is inflammation, or stomatitis, caused by infection.

Infection.—In these cases it will be found that cleanliness has not been observed in caring for the child, but that infected fingers or articles have been in constant use with the infant. If the child is bottle-fed, the bottle and nipple have been dirty and surgically unclean. No attempt has been made to provide the child with clean and proper toys, and the result is seen in a red, swollen, and irritable condition of the gums, which denotes the active presence of bacteria. When the gums are very red, tense, and swollen, the child often experiences great comfort from the local use of ice. A piece of ice as large as a small egg may be wrapped in sterile linen or gauze and the child allowed to bite it and to suck it. If possible, the ice should have been made from distilled or sterile water. When the edge of the teeth may be felt beneath the gum, the coming of the teeth may be expedited by gentle rubbing of the gum. The hands of the attendant should be made aseptic and the tip of the finger laid upon the ice and then dipped in paregoric. With this the gums should be gently but firmly rubbed while the finger distinctly feels a tooth beneath. Some prefer to use for this purpose the finger covered with sterile linen.

Ulcers upon the mouth at various portions of the mucous membrane show an extension of infection. These ulcers may be seen on the mucous membrane opposite the site of the coming tooth, or in those parts of the mouth where the finger of the nurse or attendant most frequently touches the mucous membrane. The presence of thrush often complicates this condition, and its white patches may be seen over various portions of the mouth, complicating the existing ulceration. The child's temperature is slightly elevated to 100° or 101° F., it is more than usually fretful and thirsty, and constantly endeavors to introduce into the mouth some substance which will relieve its disagreeable sensations. On the other hand, it is afraid of being touched, and the effort to examine the mouth is often strenuously resisted. If these cases are allowed to go on unchecked, ulceration may proceed to a considerable degree, the result being a chronic periostitis about the tooth, which may result in alveolar abscess. Bacteria are sometimes swallowed by such children, giving rise to an infection of the intestinal tract.

Treatment.—The treatment of these cases consists in removing sources of infection, by forbidding the introduction of soiled fingers and dirty toys within the mouth.

The use of a simple cleansing spray of boiled water, of boric acid and glycerin, as already described, is usually efficient. In some cases boiled water and sodium salicylate, five grains to the ounce, may be employed. With the removal of the exciting cause the difficulty usually disappears.

The Mouth in Infantile Scurvy.—Attention must be called to a peculiar condition of the mouth, due to infantile scurvy, which may be confounded with the appearance caused by the coming of teeth. In these cases it is often impossible to localize the condition in the mouth. The gums are red, soft, and dark and purplish, but this appearance cannot be referred to any one tooth or group of teeth. The gums may be so congested that oozing of blood follows contact, but ulceration is not always present. Inquiry will disclose the fact that the child has been fed upon highly sterilized milk, with the omission from its diet of fruit juices for some time. The differential diagnosis is made by carefully ascertaining the general condition of the child and its method of feeding, and by observing the fact that the condition present is more a general than a local one in the mouth.

Aphthous Stomatitis.—Aphthous stomatitis may appear during this period of development, and begins in the form of small, whitish spots or follicles, followed by an exudate and ulceration. This usually accompanies some derangement of the digestive tract, the child losing power to assimilate food and often suffering from constipation or diarrhœa. If neglected, the aphthous condition of the mouth speedily becomes a state of ulceration, and may persist for a considerable length of time.

In many children, especially those who are strong, very little constitutional disturbance follows the development of this condition. The pulse and temperature are very slightly disturbed, while digestion is so slightly interrupted that the caretakers of the child frequently ascribe its disturbed health to some temporary affection of the stomach or bowels. The diagnosis of this condition consists in observing its form of invasion, which is by the development of aphthous spots or follicles, followed by an exudate and then by superficial ulceration.

It differs from infectious stomatitis in the fact that ulceration about the tooth rarely occurs, and it differs from diphtheria in its slight effect upon the child's general condition; and from the sore mouth of scurvy by an absence of the dark color, soft and almost bleeding condition of the affected gum. Strict cleanliness, with the plentiful use of sprays of dilute astringents and antiseptic solutions, with attention to the digestive organs, usually results in speedy cure.

General Disorders During Dentition.—The general disorders attacking the child at this period of development are, first, those which result from an increased secretion of the mucous membrane of the digestive tract. The increased formation of fluids in the mouth is accompanied by a gastro-intestinal catarrh, which, if aggravated by improper feeding, may eventually become a serious matter. The first symptoms of this condition are the presence of mucus in the child's evacuations, and the occurrence of diarrhœa or obstinate constipation. The constitutional disturbance of the child may be so slight as to be scarcely observed. If the child be closely watched, it will be seen that its appetite is either less or more than formerly, and that it may exhibit a lack of enjoyment in articles which had previously been favored sorts of food. Slight distention of the abdomen is present, and in some cases the child's bowels move within an hour after the taking of food, the movement being accompanied by straining and the expulsion of gas. The pathology of this condition is a simple hyperæmia, with increased secretion of the follicles of the mucous membrane from the stomach and intestine. As long as infection does not occur through the mouth, this condition may pass away without serious injury to the child. Should, however, through impure food, the intestinal tract become infected, a serious type of enteritis may develop.

Treatment.—The treatment of this condition calls for the careful revision of the child's diet. Milk should be strictly clean and pure; and unless this is positively the condition, milk should be Pasteurized. It is often well to omit one or two feedings of milk in these children, and to substitute beef juice or chicken and mutton broth. The quantity of food may often be slightly diminished to advantage. If the child has been taking starches of any sort, the amount of starch taken may also be lessened with great advantage. If the child's tongue be furred and coated, it may be given sufficient calomel to produce a free flow of bile, followed by the administration of castor oil to empty thoroughly and cleanse the intestinal tract. If the liver is not especially torpid, rhubarb, given in small doses for several days or a week, often brings about an excellent result. This may be used in powder in the following prescription, for a child eight months old:

Powdered rhubarb	gr. 1.
Sodium bicarbonate	grs. 6.
Aromatic powder	grs. 6.

In 12 powders: one to be taken two or three times daily with food.

In other cases irrigation of the intestine with normal saline solution, once daily for several days, is of great value. In cases where the condition is obstinate the administration of creosote in brandy and glycerin is often advantageous. The following formula for a child eight months old may be employed:

Beechwood creosote	**3 drops.**
Brandy	**ʒ 2.**
Simple elixir	**ʒ 2.**
Water to make 3 ounces.	

A teaspoonful three times daily with food.

If such children have not worn flannel, the abdomen should be covered by a flannel binder, and, unless the weather is excessively hot, the entire body should be clad in woolen. The use of dilute mineral waters is often beneficial in infants who inherit a gouty, rheumatic tendency. Thus lithia water may be taken by an infant of any age. Very light Vichy may also be employed to advantage. If a condition of simple gastro-intestinal catarrh be recognized and promptly treated, many cases of serious and obstinate enteritis can thus be averted.

Bronchitis.—An abnormal condition of the mucous membrane of the bronchial tubes is sometimes observed in children during dentition. If this be complicated by exposure to cold and damp, a catarrhal bronchitis may be set up, which may proceed from the larger bronchi to the termination of the tubes, occasioning a serious complication. In well-nourished children who are suitably protected from cold and damp this rarely happens, and most of these cases terminate in spontaneous recovery after but slight illness.

Disorders of the Throat and Ears.—The cavities of the skull connecting with the mouth are especially liable to catarrhal inflammation should an abnormal condition of the gums arise during dentition. Catarrh of the Eustachian tube very frequently occurs, and the process may extend to the middle ear and inflammation and abscess be the result. Occasionally a similar process in the frontal sinus or in the antrum is seen in neglected and infected cases. In dealing with the ear troubles complicating dentition the practitioner must remember that, unless the mouth has been infected, the Eustachian tube and middle ear are not the seat of an active infectious process, but that poisonous bacteria may be absent from the mouth and ear. The greatest caution is necessary to avoid introducing from without septic matter into the ear. No object should be thrust into the ear, syringing should not be employed, but the meatus should be thoroughly occluded with baked and sterile cotton. Round the edges of the meatus, where the discharge comes in contact with the skin, a simple, clean fat should be used to prevent excoriation of the integument. If this precaution be taken, simple abscess in the middle ear, with rupture of the drum membrane, may discharge, and healing follow without impairment of hearing and with very little constitutional disturbance. If, on the other hand, by careless syringing or the introduction of various articles within the ear, the ear becomes actively infected, the most serious consequences may follow. Mastoid abscess and meningeal infection have been known to occur in these cases.

Convulsions.—The occurrence of convulsions in children during dentition is not an unusual complication in ill-nourished infants with unstable nervous systems. The control of the convulsion is best effected by the inhalation of a small quantity of anæsthetic vapor, or by the immediate placing of the child in a hot bath, with cold affusions to the head. Sedatives in the form of hydrate of chloral, bromides, antipyrin, or codeia may be used in doses proportionate to the age of the child. The child should be thoroughly examined, to discover the point whence the reflex cerebral irritation has arisen. If the mouth be inspected and periosteum be found drawn tightly over the coming tooth, this membrane should be divided with a knife. If, however, no tooth can be found over which the gum is pressing, the lancing of the gums is not indicated and will do no good. Painful ulcers of the mouth should be touched with an escharotic, and then thoroughly cleansed with boric acid solution. The condition of the child's ears and nostrils, of its respiratory and digestive tract, should be thoroughly investigated, and very few cases are found which are not greatly improved by thoroughly emptying the intestinal canal. Male children should be examined to ascertain the presence of phimosis, and female children should be inspected to ascertain the presence of an irritating and inflamed condition of the vulva. Thorough examination of an infant who has a convulsion during dentition is quite as likely to find some other cause than a tooth for the convulsion as to demonstrate that the cutting of teeth is the cause of the child's complication. While there can be no question of the relief afforded by freeing a tooth from compressing periosteum, it is also equally true that, unless the tooth is evidently held firmly back by this membrane, lancing of the gum is of no value. In cases where meningitis develops, following convulsions during dentition, it will be found that some other cause than tooth cutting has brought about the meningitis. Thus, tubercular infection, septic infection from the ear, or a neglected injury to the head will be found to account for most of these cases.

The nervous system in many children is much more susceptible of external irritation during the period of development when teeth are formed. A child becomes at times fretful and restless, and may try the patience of nurses and caretakers severely. At such times especial caution is necessary to give it an increased amount of fresh air. If the child sleeps poorly, it is well to avoid the use of drugs as long as possible, and by bathing at bedtime, by selecting a quiet room, and by suitable clothing, to endeavor to secure sleep in this way. In children who suffer from constipation and from the formation of gas in the intestines, sleep is much promoted by the administration of an enema to empty the bowel at bedtime. If sedatives are necessary, the bromides of ammonium and sodium, or antipyrin given in one-half grain doses for a child eight months to one year old, may be used for some time without injury. Opium should be avoided, if possible, while some children are greatly improved by the administration of alcoholic stimulants. It is much better, however, in the case of a restless child, to give tonics and to increase the nutrition of the infant, rather than to trust to sedative and anodyne drugs.

CHAPTER XI.

THE INFECTIOUS DISORDERS OF INFANCY.

Pre-natal Infection.—We have already described those pre-natal infections which most frequently attack the child. Diagnosis and treatment depend upon the recognition of the infection in the mother, while, so far as treatment is concerned, the child is accessible only through the medium of the mother's body. The success of treatment in these cases will depend upon the early recognition of the mother's disease and the prompt and vigorous treatment which she receives.

Post-natal Infection.—The infant is subject to the contagious diseases of childhood. While at times the new-born child shows remarkable immunity from contagion, this is exceptional, and cannot be counted upon in the management of young children. When contagion arises in a household, an infant should be especially guarded, as the contagious disorders are frequently severe in infancy. Thus whooping cough in an infant is frequently followed by catarrhal pneumonia and by fatal result. Measles frequently precedes capillary bronchitis in infants, and infection of the middle ear is commonly seen after scarlatina.

Symptoms of the Infectious Disorders in Infants.—The symptoms usually seen in older children are observed in infants, with the exception that, if the infection be a severe one, the nervous system of the infant may be so speedily overcome that it does not live sufficiently long to enable the disease to develop in a typical manner. Thus, in a severe infection with scarlatina, the child may die with fever and coma before a typical eruption develops. The physician is frequently obliged to withhold a positive diagnosis as to the precise nature of the infection which attacks the infant. Attention is called to the fact that the mucous membrane of the throat often shows signs of a constitutional infection before the skin lesions have become apparent. The degree of severity of the infection may be appreciated by the height of the fever and its effects upon the nervous system.

Treatment.—The treatment of the infectious disorders of infancy should be the same as that which proves successful with older children. Infants bear antitoxin well, and there need be no hesitation in resorting to the hypodermatic use of remedies with infants. In regulating dosage, it is well to begin with a minimum dose and increase it as the conditions demand. In general, it must be remembered that infants bear stimulants well, but that they are poor subjects for depressing or narcotic remedies. As our knowledge of specific medication by appropriate sera increases, infants, as well as older children, will be promptly rescued from the more dangerous infections.

Vaccination.—During the prevalence of smallpox it is the physician's duty to vaccinate pregnant women, as well as other patients. We cannot positively assert that the unborn child is thus protected, but the mother certainly is, and in that sense the child *in utero* is completely protected by vaccination. The writer has never seen the slightest inconvenience follow vaccination during pregnancy. The lower extremities should never be selected for vaccination in pregnant women.

If vaccination be done under antiseptic precautions, the infant may be vaccinated at any time after birth. The responsibility of the physician to practise antiseptic precautions is especially great in the case of infants, because mixed infection is resisted so badly by these patients. The outer aspect of the leg at the largest portion of the calf should be selected, and usually the choice of a leg will depend upon the habit of the mother in holding the child. That leg should be selected which is usually most distant from the body of the mother as she holds the infant in her arms. The surface selected should be scrubbed with tincture of green soap, rinsed with sterile water, and then scrubbed with alcohol of good quality. The physician's hands should first be thoroughly cleansed and made antiseptic, the scarifying needle should be sterilized in the flame of an alcohol lamp, and sufficient lesion of the skin produced to bring about an oozing of bloody serum. Lymph in sterile glycerine is our preference, and should be placed upon the scarified surface, and the surface again gone over with the sterile needle. An abundance of lymph should be used, and it should be thoroughly mixed with fresh serum. When the vaccination lesion has dried, a shield may be employed until the vesicle forms. It is especially important that the vesicle should not, if possible, be broken, but that the lymph should be allowed to dry and a firm crust form. When this has occurred, the surface should be protected by a dressing of sterile gauze, kept in place by a gauze bandage or by adhesive plaster. Should a free discharge of fluid occur, the dressing should be repeatedly changed, and should there be much irritation, an ointment of sterile vaseline, sterile lanolin, and boracic acid may be employed to advantage. The skin about the point of vaccination should be cleansed with alcohol whenever the dressing is renewed. With these precautions we have never seen mixed infection or serious illness follow vaccination. Failure to secure successful vaccination should be followed by another attempt as soon as convenient.

Maternal Infection Following the Infection of an Infant.—When an infant is attacked by a contagious and infectious disorder, the mother may have a counterfeit of this disorder, although in earlier life she may have passed through the same disease. Usually, however, her symptoms are milder and the course of her disease shorter than in the original infection. Many ascribe these cases to mental sympathy, and believe them to be derangements of the nervous system only. It is, however, impossible to prove this assertion, and we cannot in these cases distinguish between a nervous counterfeit of disease and a mild infection occurring in a person partially immune to the original infection. Usually the consequences for the mother are not serious, and if the child does well her convalescence is speedy.

Modes of Contagion and Infection Among Infants.—Unquestionably, most contagious disorders occurring among infants arise from the medium of contagion. The mouth and throat may be infected by the kiss of a person diseased. Toys may convey infection, clothing and bedding may carry infection, and in some cases the air is probably the offending agent. With some disorders the spread of disease from one infant to others in a family or hospital may be safely managed by a strict quarantine. This is especially true of scarlatina and diphtheria. In measles and whooping cough it is unsafe for children not infected to remain in the same building with one who is. In all suspicious cases the infant should be isolated as promptly as possible, and every precaution taken to prevent the spread of disease. By the use of telephones from the sick room to other portions of the house, a very strict and efficient quarantine can be maintained.

PART VI.

THE JURISPRUDENCE OF OBSTETRICS.

CHAPTER I.

ABORTION.

METHODS OF PRODUCING ABORTION.

Compression of the Abdomen.—One of the most frequent medico-legal questions coming before the physician is the determination of the presence or absence of a criminal element in a case of abortion. By the term we understand the expulsion of the ovum before the period of viability. This may be brought about purposely by the mother in one of three usual ways: First, by actions upon her part which are intended to secure the expulsion of the ovum, but which do not include any manipulation of the uterus. The first of these is the familiar expedient of women illegitimately pregnant, which consists in lacing so tightly as to force the uterus downward and seriously prevent the development of the fœtus. Only those physicians who see large numbers of such cases can appreciate and believe the degree of fœtal injury which can arise from this action. The development of the child is so greatly interfered with that it may be able to survive but a moment after birth. It is deficient in weight and vigor, although the skeleton seems least influenced by this condition. The uterus of the mother may be carried so forcibly downward into the pelvis that considerable mechanical injury may be done to the cervix and lower uterine segment. The tissues have been found bruised and infiltrated with serum from this cause. The head of the fœtus is carried into the pelvic brim, and in extreme cases the child is forced so low down that the motions of walking, climbing stairs, or lifting sooner or later bring about its premature expulsion. While this, in the eye of the law, might not be recognized as a method of committing abortion, its results in many cases are successful in the accomplishment of that object.

Women desirous of obtaining abortion frequently distort the abdomen as much as possible by compression, thus altering the contour of the womb, and then apply to a surgeon for the removal of an abdominal and pelvic tumor. The mistake in diagnosis may readily be made in one of these cases. The surgeon, missing the contour and usual appearance of the pregnant uterus, may accept the diagnosis which the patient suggests, and hysterectomy has been performed in these cases. In the writer's experience a woman sewed strips of steel into a corset, and while illegitimately pregnant she so compressed the abdomen as to force the child almost upon the pelvic floor and to completely alter the contour of the abdominal tumor. She induced her physician to send her to a surgeon for operation as a case of uterine tumor. Had not a careful examination been made, the attempt to secure hysterectomy would have been successful.

Abortion Following Exertion.—Women often succeed in ridding themselves of an embryo by violent exertion. Lifting a heavy weight, going up and down stairs, carrying a weight, jumping, washing clothing with violent to-and-fro movements, standing upon a chair or ladder and reaching persistently above it, running a sewing machine violently, riding a horse or bicycle to excess—all these expedients have been used and have been successful. It is very hard, however, in such a case to prove the criminal intent, as the woman may allege that her occupation obliges her to perform such action. Women occasionally have recourse to violence directed to the abdominal wall to induce abortion. Thus, a woman may strike and bruise her abdomen, claiming that she fell or that she was struck by another person. In extreme cases insane women and very ignorant persons have been known to injure themselves severely by such action.

Abortifacients.—Second, the effort may be made to induce abortion by the taking of drugs. Any drug which produces violent irritation about the intestine or pelvic organs may result in the production of abortion. Such, for example, are the drastic purgatives, aloes, croton oil, jalap, gamboge, and elaterium. A substance producing violent emesis may cause abortion through the violent efforts of vomiting. Drugs which act directly upon the uterus are ergot, nux vomica, and quinine. The first will produce uterine contractions, and may succeed in expelling the contents of the womb. Its success will depend, however, more upon the condition of the endometrium than upon any other factor. The writer recalls the case of a healthy young woman who secured a prescription including ergot, and who took double doses twice as frequently as the prescription called for without producing abortion. She subsequently went to term, and was delivered of a healthy child. When, however, the ovum has become partially separated from the uterus, ergot is usually successful. Strychnine and quinine tend to produce abortion if that process has already begun. In fatal doses strychnine produces tetanic uterine contractions, which would naturally tend to empty the womb, but in ordinary tonic doses neither can be said to produce abortion. In addition to these substances, there is a considerable class of irritant ethereal oils, among which savin, tansy, rue, and others are used for this purpose. They act upon the genito-urinary system, producing intense irritation of the kidneys, with inflammation of the stomach and intestines. Their action upon the uterus is uncertain, and they frequently fail. Aloes, by its action in favoring congestion about the pelvis, may become an abortifacient in some cases. Many of the remedies sold for this purpose are inert, and depend for their sale upon fraudulent advertisements and claims of properties which are in no way present. In general, it may be said that, in a healthy woman where the lining membrane of the uterus is healthy, no drug can be relied upon to produce abortion unless it be given in such large doses as to put the patient in great danger through its irritant and poisonous properties.

Interference with the Uterus.—The third and most usual method of producing abortion consists in active interference with the uterus. This may be attempted by injecting various substances into the vagina. Hot douches have been employed, continued for a considerable period. Injections of acids and of alkaline substances have been used. In a case under the observation of the writer the patient had attempted abortion by vaginal injections of oxalic acid. Cold douches are occasionally employed. Among abortionists the attempt is sometimes made to introduce within the uterus an irritant and stimulating substance which may produce abortion. Thus, glycerin has been recently employed for therapeutic abortion, and has doubtless been used in criminal cases. The use of injections to produce criminal abortion may be attended by rapidly fatal results, if the injection is practised in such a way as to force air and fluid within the womb. Sudden death may occur after such an injection given with a piston or a bulb syringe. Where a fountain syringe is employed this accident rarely happens. As a rule, the effort to produce abortion by injections is very often a failure. Hot injections are not continued sufficiently long, and are not given with sufficient thoroughness to produce the desired effect. Few abortionists are sufficiently versed in manipulation to make effective injections into the uterus.

A most common method of producing criminal abortion consists in thrusting into the vagina some substance which shall penetrate the uterus, rupturing the membranes and exciting uterine contractions. Among pregnant women any convenient article may be employed. A stick, a piece of wire, a whalebone, a catheter, a large feather; in fact, any object may be taken for this purpose. Women are occasionally found who have become expert in this manipulation, and who introduce an English catheter into the uterus with great facility.

Among such women this manipulation is usually done after one menstrual period has been missed and signs of early pregnancy begin. If the membranes are ruptured, there is a slight flow of blood and fluid, and the patient goes about her occupation, saying that her sickness is coming back. Such a woman will carefully see to it that the ovum is immediately destroyed, and that all evidences of abortion are removed.

Illustrative Cases.—In India, where child marriage is common and abortion is frequently practised, violent emetics, purgatives, and irritants are employed. Sticks wrapped with cotton smeared with a paste of pounded nutmeg, capsicum seeds, croton seeds mixed with arsenic, sulphate of copper, and carbonate of potash are used as uterine dilators. Septic infection is the usual result of such interference. Barnes[236] reports the case of a woman who practised abortion upon herself repeatedly. On this occasion she injected a solution of acetate of lead into the uterus, producing fatal shock. Although she had introduced a catheter, she had not ruptured the membranes nor wounded the endometrium. Hektoen[237] and Mann[238] report cases in which the womb was perforated and the intestine prolapsed into the genital canal. Hektoen's case died, and at autopsy a catheter was found behind the liver in the abdominal cavity. Mann operated upon his patient, who recovered. The course taken by foreign bodies placed within the uterus to produce abortion resembles that seen in cases where fragments of needles have been lodged within the body. Goenner[239] describes the case of a woman who retained a piece of catheter in the pelvic cavity for a year, finally expelling it through the rectum. Wylie[240] reported the removal of a glass rod from the region of the left kidney. The patient had introduced this rod within the womb to produce abortion. Duncan[241] opened the abdomen and removed a knitting needle projecting through the fundus of the uterus. This had been thrust through the umbilicus to produce abortion. The mother recovered. The use of foreign bodies to produce abortion is not, however, so fatal as the injection of irritating substances. Seydel[242] describes the case of a woman who took internally wine and mustard to bring on abortion, and, failing in this, injected wood vinegar into the uterus. The patient died in collapse, and an ulcer was found in the uterus opening into the abdomen, with extensive disintegration of blood with jaundice and peritonitis. Brine and soap injected into the uterus are reported to have caused death, while even the injection of water has been followed by the entrance of air, with an immediately fatal result.

Abortion by Professional Abortionists.—Most cases of criminal abortion are done upon ignorant young women illegitimately pregnant, and are performed by midwives or by professional abortionists. The most skillful abortionists avail themselves of the modern operation of curetting the uterus for endometritis. The patient is brought to such a physician; he finds the womb slightly enlarged, and states that evidences of endometritis are present. The patient is taken to a hospital or to a house kept by a nurse, the statement being made that she comes to have the womb curetted for chronic inflammation. After suitable preparation the patient is anæsthetized, the uterus dilated, curetted, and packed with gauze. The operator is careful to break up thoroughly any pieces of embryo, often describing them as the results of membranous endometritis. Many of these cases pass undetected, while others may be recognized by an intelligent nurse in attendance, or by someone who has seen the patient before the operation. It is unfortunately true that this form of criminal abortion is produced by those thoroughly versed in obstetrics, and whose knowledge of antisepsis is such that they rarely are detected. In the hands, however, of more ignorant quacks, criminal abortion is done in a hasty, bungling manner, with little if any pretence to antiseptic precautions. A uterine sound is most commonly employed, while a catheter and stylet are often used. In some cases the operator makes no mention of abortion, but finds the womb enlarged and introduces a sound to ascertain its depth. Occasionally abortionists employ tents or some form of packing to bring about the desired result. If this be done without antiseptic precautions, it is even more dangerous than the use of a dirty sound.

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[236] Barnes: Transactions Indiana Medical Society, 1895, p. 241.
[237] Hektoen: American Journal of Obstetrics, July, 1892.
[238] Mann: American Journal of Obstetrics, May, 1895.
[239] Gönner: Centralblatt für Gynäkologie, January, 1894.
[240] Wylie: New York Obstetrical Society, February 16, 1892.
[241] Duncan: Proceedings of Obstetrical Society of London, Vol. 34, part 3.
[242] Seydel: Vrtjh. Schft. für Ger. med., 1894.

Frequency and Mortality of Abortion.—Phillips[243] collected statistics from 75 physicians, who estimated that 63½ per cent. of all cases of abortion were criminal. They believed the average death rate to be 2 per cent. The same observers considered that 49½ per cent. of those women having criminal abortion remained chronically ill. When spontaneous abortion occurred, a mortality of 1.3 per cent. was reported, while the morbidity was 38½ per cent. These statistics were obtained from physicians practising in small towns. A special committee to investigate criminal abortion reported to the Michigan State Board of Health[244] that 100 physicians estimated that one-third of the pregnancies in their observation terminated in abortion. This would mean not less than 100,000 yearly. This committee estimated that 6,000 women die yearly from abortion. Rentoul[245] estimated that one in twenty legitimate pregnancies ends in still-birth, and one in ten illegitimate. Bertillon estimates the proportion of illegitimate still-births to legitimate still-births as 193 to 100. In Denmark twice as many still-births occur in illegitimate as in legitimate pregnancies. Tardieu estimates the proportion of criminal abortion at 50 per cent. in a large number of cases. In a smaller number he has seen it rise to 64 per cent. The records of hospitals to which many cases of criminal abortion are sent in a septic condition give abundant evidence of the high mortality and morbidity rate which attends these cases.

The Duty of the Physician in a Case of Criminal Abortion.—The duty of the reputable physician in a case of criminal abortion is a matter which requires tact and caution. When called to a case of pelvic peritonitis in an unknown woman, no matter what her apparent respectability may be, the physician should keep accurate notes of her condition and his own actions, that he may make a competent witness if called by the Commonwealth. A very interesting question has recently arisen as to whether it is the duty of the physician to inform the authorities regarding the commission of a crime, or whether the patient's condition and the criminal abortion form a professional secret which he is not at liberty to divulge. A common-sense view of the case would be that the physician's first duty is to his patient, to save her life if possible, and that his second duty is to cause the detection and punishment of those who have committed the criminal abortion. If the patient has made the effort herself, it is the duty of the physician to save life if possible and to keep her secret. If, however, she has been operated upon by others, and especially if a fatal issue occurs, he should at once lay the facts before the authorities, and assist in every way in the detection and punishment of the criminal. It is only by prompt and vigorous action by the reputable profession that the criminal abortionists can be driven out.

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[243] Phillips: Transactions Maine Medical Association, 1896, Vol. 12.

[244] Transactions, p. 165.

[245] Rentoul: British Medical Journal, 1895.

A most striking and instructive case illustrating the law of professional confidence is the case known as the Playfair-Kitson case. Playfair, a distinguished obstetrician, was called in consultation to a case in which he detected evidences of pregnancy. This pregnancy could not be legitimate. In conversation with a member of his family he gave some impression regarding the moral character of the patient which was unfavorable. Suit was entered against him for a considerable sum.

In most of the States of the Union the law holds that knowledge prejudicial to a patient gained by a physician during professional attendance remains an inviolable secret with the physician. This holds true regarding evidences of immorality, as well as knowledge of any criminal action. Reputable physicians can often aid local authorities by reporting anonymously cases of criminal abortion so soon as the patient is seen. If the name of the perpetrator of the crime is obtainable, valuable evidence may be collected, which may be used or retained for later use should occasion arise. A prompt report of cases of criminal abortion would assist greatly in stamping out the evil.

Diagnosis of Criminal Abortion.—Positive evidence of criminal abortion consists in those conditions which prove that pregnancy is existing, or has until very recently been present. The most important evidence that a woman has been in early pregnancy consists in the shape and condition of the uterus. When the body of the womb is found symmetrically enlarged above the cervix, the cervix softened, and the mucous membrane about the mouth of the womb softened, the presumption that pregnancy has existed recently is very strong. If, in addition to this, a portion of an embryo can be taken from the uterus and proved to be such by gross or microscopic examination, the proof becomes positive. The physician must not neglect the condition of the breasts, and the turgid state of the bloodvessels in the vagina and pelvic floor. But it must be repeated that positive evidence depends upon anatomical conditions. The detection of the method by which the abortion has been produced will depend largely upon the presence or absence of evidences of violence about the vulva and vagina or the uterus. Where irritant drugs have been given, the symptoms of hyperæmia of the mucous membranes will be present, but direct mechanical injury will, of course, be lacking. Where, however, the uterus has been entered by an instrument, there will usually be found in the vagina or upon the cervix abrasions and marks of violence which are very significant. This should be carefully noted by the physician, and in suspicious cases he should inspect the parts carefully before making a vaginal examination. If this be done, the defense cannot urge that his examinations and manipulations may have caused the lesions which he cites as evidence.

The diagnosis of criminal abortion may be obscured by the occurrence of menstruation following violence. Those cases are reported of girls about to menstruate, but who had never been unwell, who were exposed to conception and then given liquor and drugs to induce abortion. Pain and a bloody discharge followed. On thorough examination no evidence of pregnancy was present, and menstruation had evidently been excited by the violence done to the patient. Cases of adults are also reported in which amenorrhœa was present through some cause other than pregnancy, and in which exposure to local or general violence was followed by hemorrhage from the womb. In these cases it was impossible to establish a diagnosis of pregnancy, and hence a diagnosis of criminal abortion could not be made.

Treatment of Criminal Abortion.—When these patients are seen by a reputable physician, they are usually suffering from septic infection. Pelvic peritonitis may or may not be present. The pulse and temperature indicate the infection, while the nervous depression in these cases is often remarkable. The emotional strain to which the woman has been subjected seems to intensify the action of the septic poison upon the nervous system. In abandoned women alcoholism and venereal disease serve to intensify the virulence of the septic process. Many of the most remarkable examples of profound infection are met with in cases of criminal abortion. The majority of these patients die, and the cases are usually hopeless when brought to the attention of lawful physicians. Such cases are frequently sent to hospitals under a diagnosis of inflammation of the bowels, with the hope that the cause of death will not be discovered.

Physicians must be cautious in attempting the treatment of cases of criminal abortion. The first impulse of the physician is to anæsthetize the patient and to thoroughly empty the uterus. The patient's condition, however, may be such that she cannot bear anæsthesia, and that this would be a most dangerous proceeding. It is best to delay in these cases active interference, giving the patient stimulants abundantly and supporting her in every possible way. Should she rally from the violence of the infection, the opportunity to operate may occur later. As a rule, more cases of abortion which have become septic will recover without operation than with it, provided the patient be stimulated, kept clean, and abundantly fed. A further reason for delay in abortion is the fact that if the patient be in a critical condition, the performance of an operation may not only turn the tide against her, but give to the criminal the defense that the patient died from operation and not as a result of the abortion. It is safer, then, to carry out a line of supporting treatment until the patient has had ample time to rally as much as possible.

Results of Criminal Abortion.—Should a patient survive the abortion, she is likely to suffer permanent injury from its effect. Chronic endometritis of septic origin, pelvic abscess, adhesions of the pelvic peritoneum and of the pelvic viscera will usually oblige her to seek operative relief. It is only in rare cases that a woman survives criminal abortion to recover her health.

CHAPTER II.

LEGITIMACY OF BIRTH.

Duration of Gestation.—The question of the duration of normal pregnancy is frequently of great importance when the inheritance of property or the succession to a title depends upon the determination of the legitimacy of offspring. Authorities agree that it is impossible to state the exact duration of pregnancy. This is so because it can rarely, if ever, be ascertained whether conception results from the impregnation of an ovum formed at the preceding menstrual period, or whether an ovum discharged during or after cohabitation has become impregnated. Menstruation and ovulation may occur independently, and another factor contributing to the uncertainty of the problem is found in the varying life of the spermatozoids after their entrance into the body of the mother. Various authorities state that pregnancy with viability may vary from two hundred and forty to three hundred days, and there is abundant evidence in recorded cases to prove the variability of the periods of gestation.

Many instances occur in practice in which the closest calculation on the part of women who have borne children leads to the determination of a certain date for an approaching confinement, where pregnancy has been observed to go from two to three weeks beyond this period. Three hundred-day gestation has been observed on several occasions by the writer.

Viability.—On the other hand, favorable conditions in the development and nutrition of the mother may produce a child, born at seven or eight months, vigorous enough to thrive and comparing favorably with other less favored children born at nine and one-half months.

Where skilled care is given to the infant, it must be remembered that modern methods of treatment have extended the period of viability in rare cases to six months, and in a considerable number to six and one-half. While various codes of law prescribe different periods at which the child may be thought viable, the practitioner must remember that viability depends more upon the development of the fœtus than upon its uterine life during seven or eight or nine months. The dimensions of the average infant at term have been already given, and also its weight. From six and one-half to seven pounds is the average weight at term. In addition to the dimensions stated, it must be remembered that corroborative evidence of the viability of a child is found in the color of the skin, the prominence of the cranial bones, the growth of hair upon the head, the nails, the condition of the genital organs, and the degree of ossification present in the femur. The size of the infant at the various months of gestation has been already given.

Parentage.—In determining the parentage of a given child, the resemblance of the child to those claiming to be its parents must be carefully considered. This resemblance may be in the form of a likeness in the features, or a family resemblance existing in former generations may be reproduced in the most recent offspring. Thus, the infant may resemble its grandparents, or it may have some anatomical deformity which is known to occur in that especial family. It has been found by experience that the portion of the body most reliable for its identification is the ear. It is impossible to disguise the ear, and hence police authorities are accustomed to rely upon this fact very largely for positive identification.

In some families a slight peculiarity in the structure or curves of the ear may be present, reappearing at various generations, sometimes remaining absent for a generation. If such a family peculiarity be present, it would furnish evidence of value that the child in a given case was a member of that particular family.

Another means of identification lies in the transmission of birthmarks from parent to child, and especially from mother to child. This may be in the form of an angioma, or, if the mother gives a history of having been frightened, a mark upon the fœtus may in some way reproduce the source of her alarm. It has been claimed that boys resemble most the mother and girls the father, and in estimating this resemblance the predominant influence of the father in determining the stature of the child should not be lost sight of.

Substitution of Infants.—Cases are occasionally met with in which, to secure an inheritance, an endeavor is made to substitute a child, and thus deceive the father or the courts. In these cases the infant must be carefully scrutinized to determine positively that it is exactly at that period of life which the alleged child must have reached. Thus, a child several days old may be procured to personate a new-born babe, and in this case examination of the umbilical cord would detect the fact that the child was several days older than was alleged. The process of mummification in the cord would naturally be much further advanced than in the new-born infant. The discharges from the intestines would also be valuable in determining the age of an infant, as it is well known that the meconium does not persist but a few days in the healthy child. New-born infants frequently show uric-acid crystals in the urine, which stain the diaper a pinkish or reddish color. After the first few days of life these disappear, and the urine becomes clear. A new-born child frequently does not suck with especial greed or activity, while the child several days or a week old has fully learned to obtain food from the breast. The new-born child loses weight for a few days after birth, while the child several days advanced may have begun to make good its loss. By carefully observing the child which is supposed to have been substituted, a physician will usually be able to determine that it is or is not the offspring of the alleged parent.

Diagnosis of Pregnancy in Medico-Legal Cases.—A very important factor in medico-legal cases, and especially where property is claimed, consists in an accurate diagnosis that pregnancy is or is not present. A claimant appearing for property may allege that he is the child of a woman concerning whom it is asserted that during the time in question the woman was not and could not have been pregnant. It is often necessary to establish clearly the signs and symptoms of pregnancy and the conditions under which pregnancy may be unwittingly and purposely concealed. If called upon to give testimony, the physician must remember that most extraordinary success has attended efforts to conceal pregnancy, and, on the other hand, pregnancy has remained unsuspected in a most remarkable manner in cases where no reason existed for concealment, but where some complication in pelvic disease was present. Those patients illegitimately pregnant have gone to term without discovery, and pregnancy has not been suspected in other cases where the abdomen has been opened for the removal of a tumor. Great caution should be observed in making statements in these cases, and all the facts in a given case should be thoroughly considered by a physician who is consulted or who is made a witness in a case.

While it may be said concerning pregnancy that it is the unexpected which usually happens, still gestation has its definite and well-established signs and symptoms. If a case is studied in an orderly manner with reference to the development of these signs and symptoms, a physician will rarely be in error in the matter of diagnosis. It must be remembered that a positive diagnosis of pregnancy beyond question cannot be made until fœtal heart-sounds can be heard and fœtal movements appreciated.

CHAPTER III.

INFANTICIDE.

Viability; Asphyxia.—In cases of fœtal death the physician may be called upon to determine the cause of death in a given infant, and especially the possibility of infanticide. In dealing with these cases it is first necessary to decide positively that the fœtus was sufficiently developed to have survived. This must be done by ascertaining its dimensions, and by taking the evidence which presents of the stage of its development. When it has been decided that the child was born at the period of viability, it must next be examined to ascertain whether any complication occurring during birth would have been sufficient to cause its death. If the infant is seen a very short time after birth, symptoms of asphyxia arising during labor may first be present. Such would be a peculiar bluish pallor of the skin, an absolutely flaccid condition of the muscles, rigor mortis being completely absent. Evidence of severe birth pressure would be presented by a greatly compressed and distorted skull, with an excessively large caput succedaneum, and especially if the infant were found with the cord tightly coiled about any portion of its body. If these conditions were present, a diagnosis of death from birth asphyxia would be justifiable.

Signs of Intrauterine Death.—Rigor mortis may occasionally begin *in utero* and persist for some time after delivery, so that its presence or absence is no conclusive sign that the child ever lived outside the mother's womb. Positive evidence that the child was stillborn is obtained by the presence of maceration in the skin of the infant. This begins upon the outer surface of the body in the form of blisters or blebs, the epithelium being first separated and fluid accumulating within the blisters. This is followed by necrosis of the skin and of the internal organs of the body. If maceration be positively present, it is a sure sign of fœtal death *in utero*.

Respiration.—When no evidence of intrauterine death exists, the physician naturally turns to the inquiry as to whether positive evidence is present that the child ever began to assume the necessary functions of life. As the establishment of respiration marks the change from life in the womb to life outside the mother's body, the natural question occurs whether or not the child has ever breathed. In attempting to determine this point it must be remembered that some of the efforts for artificial respiration succeed in forcing air into a considerable portion of the infant's chest. Such especially is Schultze's method. This, however, rarely produces a complete inflation of the chest, as the infant's lungs are not completely expanded for several days after birth. To determine the question as to whether the child has ever lived, the heart must be examined to ascertain whether the foramen ovale has closed. This is brought together within a very short time. If air were found in the lungs of a child while the foramen ovale was not closed, the inference would be that air had gained access by some method of artificial respiration, but that the child's heart had not continued to beat after the separation of the infant from the body of the mother. If, on the other hand, air were found present in a considerable portion of the lungs and the foramen ovale were closed, there would be very strong grounds for belief that the infant had survived its birth.

A more exact method of determining the condition of the infant's lungs consists in subjecting them to microscopic examination. If this be done and the bronchial tubes be found expanded, the walls of their terminal portions being no longer in contact, evidence that the infant had breathed would thus be presented. The condition of the epigastric arteries would also be of value in such a case.

Diagnosis of Infanticide.—Positive evidence of infanticide must be sought for in some mark upon the child's body, or some abnormality of its cord or placenta indicating that the conditions for its life had been interfered with. Infants are more frequently killed by smothering or choking. If the latter has been the method of procedure, contusions upon the child's neck or about its face and nostrils will usually be present. Thus, evidence usually appears in the shape of finger marks or marks of injury to the mouth. When finger marks are present, the child has been strangled by direct pressure upon the trachea. In some cases the child has been overlain by the mother and smothered, and in such no sign of contusion is present upon the child's throat. A child is often smothered by pressing a handkerchief or napkin into the mouth, and in these children careful examination will detect the presence of bruising or laceration of the mucous membrane, which can be shown to have resulted from injury, and not to have followed any process of disease.

Adloff[246] describes a case in which a woman walking along a road asked to be taken upon a wagon filled with sacks of potatoes. After she had left the wagon the driver noticed blood stains upon some of the sacks. On his report of the case an investigation was made, and it was discovered that the patient had been delivered of a child. The cord was torn off. The woman had wrapped the child in her clothing and carried it away with her. She stated that it was living, but that she lost consciousness, and when she became conscious the child had died. On examining its body evidences that it had breathed were present, and the skull showed that the child had been killed by heavy blows upon the head. The statement that the mother becomes unconscious after labor is not infrequently made by women suspected of infanticide. Thus Schiller[247] reports a case [illegible] birth where the mother was found by [illegible] the child screaming beside her. When help [illegible] mother made the assertion that she had become unconscious after delivery, did not know when the child died, and had not intentionally injured it. Upon autopsy, bleeding into the bronchial tubes and suffocation were found, a blunt instrument or the fingers evidently having been forced into the child's throat. Methods which have been described by the perpetrators of infanticide have consisted in holding the hand tightly over the child's mouth, in placing a feather bed over the infant, and in wrapping the child's head in an apron or some cloth. Overlying is not an infrequent cause of infant death, but is usually seen in cases of drunkenness, and may occur at any time during the life of the infant. As parturition seldom occurs while the mother is intoxicated, overlying is not a frequent cause of early infanticide.

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[246] Adloff: Vrtjhr. [illegible]

[247] Schiller: Vrtjhr. [illegible]

Difficulty of Proof in Cases of Infanticide.—It is often impossible to determine that an infant has died as the result of direct violence. Cases are sometimes seen where a child has been born living, but where it has purposely been allowed by the mother to fall for a considerable distance, producing fatal injury to the skull. In these cases the scalp is bruised over a given area, and, if the skull be carefully examined, the bone will be found to be completely or partially fractured. Complete or partial fracture of the clavicles, and occasionally of the humerus, may also be present after difficult labor. If a child has been allowed to fall or has been thrown upon the ground, bits of dirt or grass may be adherent to the scalp at the time of examination. In cases where children have been thrown into cesspools, the filth of the pool is found upon some portion of the child's body.

In the observation of the writer a new-born illegitimate child was thrown into a half-frozen cesspool during a cold winter's night. The frozen condition of the pool prevented the child from sinking and drowning. Its cry was heard by a policeman passing through an alley. The child was rescued and survived. The mother was arrested, but claimed that the birth of the child had occurred when she had gone to the closet to defecate, and that she had not intentionally endeavored to cause its death. Wolff describes the case of a dead child found beside a stone wall, and tightly wrapped in straw. A woman admitted that the child was hers, but stated that it was stillborn. She admitted to have placed it on the top of the wall. At autopsy, no sign of violence or interference was present, and the patient could not be convicted of infanticide. The resident physician of the Jefferson Maternity was on one occasion called to the house of a woman whose negro servant had been delivered of an illegitimate child. The mother was alone when the child was born, and the household were much excited over the unexpected occurrence. Pregnancy had not been suspected. The mother required instant attention, as the placenta was not delivered. She was then taken to the Maternity by ambulance. Nothing was seen of the child, the mother making the statement that it had been still-born. After the patient arrived at the Maternity, in unpacking a hand bag belonging to the patient the body of the child was found. There was no mark of violence upon it, and infanticide could not be proven.

Where the mother is in the company of dissolute, criminal, or immoral persons, a reasonable suspicion arises that the death of a new-born infant has been intentional, and persons of known bad character under these circumstances may be reasonably charged with being principals or accessories to the crime. This is illustrated in Kob's case,[248] where the body of an infant, wrapped in cloth, was found in a muff box. The mother lived with her mother, an immoral person. Although the method of infanticide could not be proved, the older woman was convicted. In most cases in which children have been born in out-houses, Casper, Hoffmann, Tandieu, LaFarge, Lieman and others could not collect definite evidence that infanticide had been purposely committed. While wounds were found upon various portions of the infant's body, they were ascribed to injury at the moment of parturition. Even evidence of suffocation, with the presence of greenish mucus in the child's pharynx, does not prove intentional infanticide, provided evidences of violence are lacking. An infant has been found dead with injuries in the mouth, fracture of the lower jaw, and hemorrhage when it was impossible to prove intentional infanticide. Comrick[249] describes such a case in which a woman asserted that in the agony of birth, when the head appeared, she had placed her thumb in the child's mouth and had pulled violently to end her suffering. She was convicted of criminal carelessness, but not of intentional infanticide.

The mental and nervous condition of the mother may also render conviction for intentional infanticide impossible. Kraft-Ebing[250] reports a case in which a child was found with the umbilical cord tightly drawn about the neck. The body had been wrapped in a woolen jacket and thrown into a pond. The mother stated that the child was illegitimate, that she had been deserted, and that birth occurred while she was working in the field. She tied her handkerchief about the umbilical cord, and the child soon after died. She did not intend to kill it. After death she placed it in the pond. It was found that she had been melancholic for some time, and had threatened to commit suicide at her menstrual periods. Under the circumstances, she could not be convicted of intentional infanticide.

Escharotic poisons are occasionally used, as in the case of Coster.[251] A teaspoonful of clear carbolic acid solution was intentionally given to an infant, with rapidly fatal result. In another case a compress, upon which pure carbolic acid in solution was placed, was bound upon the umbilicus. Death resulted rapidly.

Injuries to the Infant from Birth with the Mother in the Upright Posture.—In children born while the mother is in the upright posture the cord may be torn and the child perish from hemorrhage. Upon examining the cord, its external sheath will be found to have parted at a different level from the point of fracture of the vessels, thus forming a sort of flap or sheath over them. This accident is not invariably fatal, as it is possible for the cord to rupture without the death of the fœtus. Where, however, the cord is cut and is not tied, the child rapidly perishes from hemorrhage. Teufel[252] reports the case of an unmarried woman seized with cramps while walking upon the street. She entered a building and was delivered while standing, the child falling to the floor and crying. The mother hastily picked it up and struck the head of the child against a stove. Intentional infanticide could not be proven in view of the upright posture at birth and the lack of positive evidence of intent. In 183 precipitate births, Klein found 155 with the mother standing at the moment of delivery, 22 in which she was sitting, and 6 in which she was kneeling. Serious injury to the fœtus was rare in these cases. Numerous cases are recorded in which patients have been delivered while standing or sitting just as they were brought to a hospital, and in which the child has sustained injury of varying severity. Women have been overtaken by labor while in a bath, the child born upon the floor before the mother could reach her bed. Married women sometimes choose the upright posture for labor, the midwife or physician guarding against injury to the child. The fact of delivery with the patient in the upright posture does not prove injury sufficiently severe to result in the death of the child. Injury to the fœtus is more frequent than when the mother is recumbent, but need not be fatal. Injuries are usually to the fœtal cranium in these cases, and generally upon the side of the head. Precipitate birth exposes the child to the risk of laceration of the cord. Pfankuth[253] and Hoffmann,[254] by experiment, concluded that 1,000 grammes weight, and in some cases less, is enough to rupture the cord. Those cords break most easily which are long and thin. Tearing of the cord does not always cause fœtal hemorrhage, as the vessel may retract. If the fœtus and placenta are expelled together without injury to the cord, the child will not perish, as there will be no great hemorrhage.

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[248] Kob: Vrtjhr. schrift. für Ger. med., 1895.
[249] Comrick: Vrtjhr. schrift. für Ger. med., 1896.
[250] Kraft-Ebing: Fried. blt. f. Ger. med., 1889.
[251] Coster: Vrtjhr. schrift. für Ger. med., 1896.

Criminal Abortion and Infanticide.—If evidence exists that pregnancy has been intentionally interrupted before its natural termination, and that the fœtus has been injured at birth, criminal abortion and infanticide have both been committed. Birge[255] reports a case of this sort in which an illegitimate pregnancy was terminated at eight months by interference. The mother was alone when delivered, and asserted that she was helpless. She attempted to conceal the body. Those who produced the labor were convicted, while the mother was charged with omission only, as intentional infanticide could not be proven.

[252] Teufel: Vrtjhr. schrift. für Ger. med., 1896.
[253] Pfankuth: Archiv für Gynäkologie, Heft 7, p. 28, 1875.
[254] Hoffmann: Lehrbuch, p. 751.
[255] Birge: Atlantic Medical Weekly, Vol. 5, p. 161, 1896.

Infanticide by Poisons.—Infanticide is occasionally accomplished by the administration of substances which sometimes produce poisonous effects. Thus in Japan opium has been used in large doses, given to the mother to terminate the life of the fœtus. We are thus reminded of the effort to destroy the ectopic embryo by the use of morphia. Cases are recorded in which chloral hydrate, chloroform, opium, and digitalis have been given to destroy the fœtus. It is difficult by examining the blood or tissues of a fœtus to prove that its death has occurred as a result of drugs administered to the mother. In the case of a woman illegitimately pregnant who ate matches to produce the death of the child, Clouet found potassium in the liver of the fœtus. Cases may occur in which circumstances point strongly to the administration of poisonous substances. In the observation of the writer, a young woman who had given birth to an illegitimate child entered the nursery of a maternity hospital where her infant was sleeping, and was allowed by the nurse in charge to hold the child for a short time. The nurse left the room for a few moments, and the mother soon left her infant and returned to the ward. Shortly afterward the child died with signs of fatal intoxication by some poison not an irritant. There was no mark of violence upon the body, and upon autopsy no substance could be discovered in the body to account for death. The epithelia of the gastro-intestinal tract was in an irritable condition through some parts of the digestive canal, but no definite cause for death could be ascertained. The only possible clue lay in the fact that this girl might have stolen an antiseptic fluid and given it to the child. As young infants may readily perish without appreciable lesions, this could not be proven.

Difficult Labor and Infanticide.—It is often difficult to determine in cases of difficult labor, where the patient has been assisted in the child-birth, the exact part played in fœtal death by the manipulation of the physician. Thus, in difficult version and extraction through contracted pelvis the child may be born with a fractured skull, which might have been avoided had symphysiotomy or Cæsarean section been done. Fruitless attempts to deliver with forceps through contracted pelves cause fracture of the skull, laceration of the scalp, and fatal injury.

The humerus is not infrequently broken in such cases, while the clavicle may be fractured either unintentionally or purposely in the delivery of the child. The scalp is occasionally torn by unskillful application of the forceps. If the case be carefully reviewed, and the condition of the mother before birth of her child be ascertained, it may be found that the cause of infantile death rests entirely with the medical attendant. Modern obstetric surgery has removed the necessity for these casualties. Some of the most pronounced cases of injury of the fœtus occur in the practise of ignorant midwives, who attempt to pull the child, when presented by the breech, from the body of the mother, in utter ignorance of the condition present.

New-born children are rarely killed by the administration of drugs or poisons. In cases of criminal infanticide the mother usually has no drugs. Occasionally bits of any convenient substance are placed in the child's mouth. These are inspired into the trachea, and suffocation results. The evidences of drowning in the infant are the same as those in the adult, if the fœtus has lived and breathed.

Medico-legal authorities consider that while the child remains within the body of the mother it is not an independent being, and that injury to the child occurring under these circumstances does not constitute infanticide, but, if done with criminal intent, criminal abortion or malpractice upon the mother. Blötner[256] describes the case of a physician who was summoned to attend a patient in labor with transverse presentation. Version failed, and embryotomy was attempted. This did not succeed, and the labor was terminated by another physician. The mother died, and her first attendant was arrested. Here all that could be proven was negligent and unskillful practise. If it could be shown that a physician meeting with such an experience was intoxicated, or had a record of criminal abortion, or was not a regularly qualified practitioner, a severe penalty could undoubtedly be inflicted.

The operation of embryotomy is in no sense infanticide if performed under proper conditions. Legally qualified medical authority decides that the child cannot be born living. The circumstances of the case give adequate ground for this decision. The life of the mother is at stake. As the child is within her body when embryotomy is performed, it is no more an independent entity than a tumor. Accordingly, under proper conditions, embryotomy is justifiable.

CHAPTER IV.

THE DETERMINATION OF PREGNANCY AND PREVIOUS CHILD-BIRTH.

Pregnancy.—The physician is sometimes called upon by the court to give positive evidence as to the existence of pregnancy, or of a previous child-birth. As regards the first, the attention of the reader is directed to what has been said upon the diagnosis of pregnancy, that anatomical changes in the generative organs furnish the only positive evidence of pregnancy. This must be distinctly kept in mind in all cases where an expert opinion is required, either by a patient or by a court. If complications exist which render a positive statement at the time impossible, the physician must not hesitate so to give evidence, asking another examination later, and giving the court clearly to understand that the condition is not pronounced. In ordinary cases early pregnancy may be diagnosticated with probable certainty between the second and third month, while for a positive diagnosis examination must be made between the sixth and seventh months.

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[256] Blötner: Klin. med. Wochen.. 1887. p. 81.

Diagnosis of Recent Child-birth.—The diagnosis of previous child-birth is to be made by a thorough examination of the genital tract. Physicians who rely upon the statements of a patient may be most thoroughly deceived. It is perfectly possible for a strong young woman to give birth to a premature child and immediately assume her ordinary occupations, and to assert positively that nothing is the matter except her normal monthly sickness. Cases are on record where women, after child-birth and infanticide, have eluded detection and successfully escaped. If the question of the diagnosis of previous child-birth enters at all, it is the duty of the physician to make a thorough examination. He should practise rigid antiseptic precautions, and should precede his examination by thorough inspection of the vulva and vagina. It is almost impossible for a viable child, or even a fœtus after the fifth month, to be born in a primigravida without the occurrence of lesions in the vagina which will call attention to the fact. Such are erosions and abrasions, laceration of the fourchette, rupture of the hymen, slight laceration of the skin perineum, a soft and patulous condition of the os and cervix, with slight multiple tears, all form a condition most suggestive of parturition. A discharge of blood coming from the uterus points to very recent birth, while a lochial discharge can be referred, by its character, to the period of the puerperal state when such usually is present. In such cases the physician will frequently find within the cervix or uterus portions of the placenta or membranes, which furnish proof positive of the previous birth. The inspection of the breasts will usually complete the clinical picture. If other evidence is lacking, some of the decidual tissue might be obtained by the use of the curette and subjected to microscopic examination. The recognition of large epithelial cells of the decidua would aid materially in establishing a positive diagnosis.

Diagnosis of Remote Child-birth.—It is sometimes necessary for the physician to make a positive decision as to whether a patient has ever given birth to a viable fœtus. This may be interesting from a legal standpoint, and also from the standpoint of practical medicine, in determining the course of action in a given case. Thus, if a woman has a slightly contracted pelvis and asserts that she is pregnant for the first time, the physician naturally is without previous experience on her part to determine the probable course of her coming labor. If he takes her statement simply, he may be led to the induction of labor earlier than if he ascertains that she has already borne a child, and that the birth proceeded with but little difficulty. Hospital patients very frequently deceive in this matter, and the physician must examine the patient to determine the truth. In women who have born a viable child the walls of the vagina are seldom in apposition, as in the nulliparous woman. The presence of the hymen and fourchette, or their absence, gives added testimony. If the patient has had a surgical operation for the removal of a growth through the vagina, the necessary manipulation might have ruptured and largely destroyed the hymen and fourchette. There would rarely be, however, a tear of the perineum which would leave evidence behind.

While the cervix may be without extensive tear, still it is never so small after child-birth as before it, and the edge of the os usually presents slight fissure and thickening. If the woman did not nurse the child, the breasts may show little alteration; but there is usually some change about them to attract the physician's attention. If a woman has gone to term with a child, the abdominal wall is rarely as firm and elastic afterward, while a deposit of fat is very commonly seen in women who have borne children. A careful and systematic examination will rarely fail to give sufficient evidence to enable the physician to form a positive opinion.

While in some cases the only positive decision which can be reached is to the effect that a tumor or solid body has been delivered through the vagina, still, where the history of the patient's health is available, it can readily be determined that this was or was not a fœtus.

CHAPTER V.

THE LEGAL ASPECTS OF OBSTETRIC PRACTISE.

Legal Qualifications for Obstetric Practise.—No branch of medicine entails upon its practitioners so grave responsibilities as obstetrics, and in no branch of medicine in the United States are the legal obligations of practise so commonly violated. While there are variations in the State and city laws regarding attendance upon labor cases, the consensus of law holds that none but a legally qualified person shall deliver women and make returns to health officers for birth. A legally qualified person in most of the United States is a person holding a certificate to practise from a State board, or a person holding a diploma registered in a town or city from a medical college, or a midwife registered as such by the Health Department of a given Commonwealth. The undergraduate medical student does not come under any of these heads, but outpatient practise in obstetrics, with many medical colleges and maternity hospitals, encourages the undergraduate to deliver cases of labor, assuming the practical responsibility for these cases. An effort is made to comply with the intent of the law by saying that graduate consultants are always ready to assist in these cases; but the summoning of the consultant is left to the judgment of the student, and the most serious obstetrical emergencies may arise and terminate before the consultant can be procured. This abuse has risen largely from the neglect of obstetrics by the false conception that labor in all women is a natural process, and one which tends of itself to a successful termination. In an ideal community, where all of its members were in strictly physiological condition, this statement would be true; but in the presence of constitutional diseases and defects, and amid surroundings of poverty and filth, the converse is often more near to the truth.

Midwives.—The question of the function of midwives has occasioned wide discussion among obstetricians. The European midwife is graduated from a school under the direct supervision of a medical faculty appointed by a government university. The duties and privileges of such a midwife are exactly defined by law; she is fully instructed in these duties, and obliged to keep within her bounds, under pain of losing her certificate and right to practise. Large numbers of normal labors are attended by such midwives on the continent of Europe. This system, however, even with the restrictions put upon it, results in much harm. In many cases assistance is not obtained, when complications arise, until too late to save the life of the child and possibly that of the mother. Much valuable scientific material for study and teaching is not utilized, and the most that can be said of the practise is that it places an undesirable condition of affairs under as strict limitations as possible. In England an agitation upon the midwives question is a chronic feature of medical discussion, and while restrictions are not enforced looking to the lessening of the evil, it cannot be regarded as a satisfactory condition. The comparatively recent civilization of the United States leaves the practise of obstetrics in a very mixed condition. The large numbers of foreigners who come to this country bring with them midwives, who seek to be registered and to practise. Some of these women have had a reasonable training, while others are ignorant, exceedingly dirty, and most undesirable. As the laws of our cities are now formed, many obtain recognition and register who are utterly unworthy of such privilege.

There is, however, no place for the practise of midwives in the United States, nor is there any reason whatsoever for their existence. An abundance of physicians are ready to attend obstetric cases, while maternity hospitals exist in sufficient numbers to accommodate those who seek their wards. No patient, because of poverty, need be without competent attendance during pregnancy and confinement. It would be a great misfortune to the American profession of medicine should midwives be allowed to legally qualify for obstetric practise.

Modern Methods of Conducting Obstetric Practise Among the Poor.—The multiplication of hospitals in the United States has largely increased the skilled medical service obtainable for confinement cases among the poor. Our best medical schools have now maternities attached to their hospitals, where such cases are treated with the advantages of the best scientific methods. Our polyclinics give instruction to graduates, who are competent to attend cases in the homes of patients. A most interesting work in the teaching of obstetrics in private houses is done by advanced teachers in our large cities, who find no difficulty in sending to each case of labor a graduate, a legally qualified practitioner, to superintend the case. With the improvement in our civilization, obstetric practise should be subjected to strict legal requirement, and the obstetrician should no more think of sending a medical student to a case of labor than would a surgeon, who would not allow an undergraduate to go to the house of a patient and set a fractured limb or perform even a minor operation. It is to be regretted that hospitals occasionally utilize obstetric patients to feed their operative clinics, in utter disregard of the rights of patients and obstetricians.

The Practical Teaching of Obstetrics.—The establishment of visiting nurse societies in our large cities has made it possible to conduct obstetric cases in the houses of the poor under advantages of good nursing. It is perfectly practicable to allow medical students to attend cases of labor in the houses of patients accompanied by a legally qualified instructor, who shall permit them to take such part in the case as the circumstances allow. With the attendance of a visiting nurse and the presence and instruction of a graduate instructor, the student will obtain accurate information and become qualified to assume the responsibilities of obstetric practise. The familiar statement that the student will learn more in obstetrics by going alone to cases and meeting emergencies unprepared is a scientific absurdity, and is at utter variance with the best methods of scientific instruction in other branches of medicine.

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